Dipartimento di IMPRESA E MANAGEMENT

Cattedra di COMPETITION AND HIGH-TECH MARKETS

"PATENT POOLS: DO THEY DISRUPT TOTAL WELFARE AND INNOVATION?"

RELATORE

Prof. Di Ciommo

CORRELATORE

Prof. Granieri

CANDIDATO

Matr. 656251

ANNO ACCADEMICO 2015/2016

Contents:

1.1. Methodology

The Method I adopted in order to study the patent pools in Europe and U.S., and even Japan, has been through regulations, decisions, old and recent cases and mathematical tools adopted to understand the impact of the patent pools on the social welfare and on the technology.
Clearly the main source was the World Wide Web, the focal topics I found were in the SISVEL webpage, which is the main important company dealing with Patent Pooling.
Then traditional library search was another method I have embraced for locating sources of information.
Since this argument is not purely economic, but also related to the law and legal world, I had to report some regulations from the EU and US antitrust guidelines for patent pool.

1.2. Purposes

The attempt of this paper is to understand and show if the formation of pools could facilitate information sharing and could increase spillovers in technology development, decreasing, at the same time, the degree of product differentiation.

Otherwise, on the contrary, if the pool can adversely affect the welfare, and so the technology progress, by reducing the incentives towards product development and product market competition, even with perfectly complementary patents.

The conventional opinion is that creation of patent pools is welfare enhancing when patents are complementary, but this view does not account for the hypothetically substantial role of the effect of pooling on the innovation.

My analysis would like to show, even with the use of mathematical tools, which are the real effects of the patents pool.

2. Introduction

Modern society is strongly focused on the concept of property.

Therefore is important to differentiate between the existence regimes, which are divided in Commons[1], anti-commons[2] and semi-commons[3].

The distinction across these regimes is made according the property concerns that could be private, public or a hybrid between the last two.

The nature of the good determines a series of rights granted to the owner, in the private property case, or to the state, in the public property case.

In fact according to the art.832 of the civil code *"the owner has the right of enjoyment and availability of the property on*

[1] Garrett Hardin (1968) popularized the phrase "tragedy of the commons" and
[2] The anticommons was first conceptualized by Frank Michelman (1982, 6, 9; 1985, 6-7) and later adapted and applied by Michael Heller (1998; 2008).

[3] The term "semicommons," was coined by Henry Smith (2000) to refer to interacting private and common property uses. A different usage appears in Levmore, 2002, (referring to a system of "open access and restricted use").

a full and exclusive basis, within the limits and in compliance with the obligations set out by law ", for this reason the owner has the right to exclude others from the use of the property[4]. Instead a public property is subjected to the principle of "no-excludability".

A form of private property could protect the innovations and the relative knowledge: the IPR (intellectual property rights).

However the Patent, the Trademarks and the Copyrights could protect the Innovations.

In order to obtain a form of protection like The Patent is necessary to ask for a Patent that covers the relative knowledge. Initially the office for the Patents has to approve the request, and subsequently verified if all the

---

[4] See Steven J. Eagle, Regulatory Takings (1999); Dwight Merriam & Frank Meltz, The Takings Issue 199-128 (1999); Jan Laitos, Law Of Property Protection § 5.03[A] (1999). Daniel Mandelker Touched Upon This Issue In § 2.09 Of His Widely-Used And Well-Regarded Treatise, Land Use Law (4th Ed. 1997), As Well As In His Casebook With Richard A. Cunningham & John M. Payne, Planning And Control Of Land Development 131-32 (4th Ed. 1995), And In Daniel R. Mandelker, New Property Rights And The Takings Clause, 81 Marquette L. Rev. 9 (1997).

requirements are satisfied, then at the end it has to protect and watch over it so as to avoid that others will misappropriate once it has been released.

This form of protection, although born as protection of the owner, could lead to negative situations, like the excessive exploitation of the right of property by numerous owners that could cause the blockage of the property[5].

The knowledge, when it is locked its circulation, cannot contribute anymore to the creation of the welfare, and since the technologies are made up by different Patents, there could be an underutilization of the knowledge itself.[6]

In fact to commercialize a product with a specific technology is necessary to own all the series of Patents that are not always owned by the same subject and the bargaining to

[5] See Cristophe Grimpe And Katrin Hussinger, Building And Blocking: The Two Faces Of Technology Acquisition; Discussion Paper N°08-042; March 2009

[6] "Current empirical analyses show that there are small number of industries in which technological process is significantly stmulated by patent protection", Wolrad Prinz zu Waldeck and Pyrmont,Martin J. Adelman,Robert Brauneis,Josef Drexl,Ralph Nack, Patents and technological progress in a Globalized World, Springer Science & Business Media, 20 nov 2008

obtain them could be not only very expensive and long, but could lead also to no deal.[7]

A further block form of knowledge is the dual knowledge; in this case through the patent the owner of the property does not allow publishing news about it through scientific journals (that represent a form of free movement of knowledge).[8]

These negative effects, cited above, lead to the creation of a new debate about the validity of the property 's protection. There were two main hints: according to the first one the existence of the intellectual property right could enhance the market of new ideas in technology, it could facilitate the commercialization of new ideas attracting lenders, and it could make transparency economically advantageous (at the

---

[7] "Both pioneer and improver face a classic situation where bargaining will occasionally break down even though they could both realize substantial gains from agreement", Robert P. Merges, Contractingin to Liability Rules: Institutions Supporting Transactions in Intellectual Property Rights ,1996, California law Review

[8] "There is some evidence, however, that patent grant may reduce the extent of use of Knowledge: the citation rate to a scientific article describing a dual-purpose discovery experiences a modest decline after patent rights are granted over the knowledge" Josh Lerner and Scott Stern; Innovation Policy and Economy Volume 7; MIT Press 0-262-10121-1 February 2007

contrary, in the past the companies managed to not share their ideas in order to have an advantage over their competitors).

The second one is based on the tragedy of anti-commons[9]; according to it there could be a negative effect over the technologies developments in the traditional field.

From the debate some solving principles for the excessive fragmentation of the knowledge have been identified; the need to reduce the transaction costs, and the need to reduce the number of subjects required negotiating.

In order to obtain such results there is a new practice of licensing, with the aim of accomplish the two principles, called Patent Pool[10].

The Patent Pool is an entity different from the representative companies, which gathers a series of Patents

[9] "The "tragedy of anticommons" refers to the situation where the existence of multiple gatekeepers for a common resource can lead to an underutilization of that resource", Heller Michael "The Tragedy of the Anticommons", Harvard Law Review, (January 1998).

[10] " A patent pool is an agreement among patent owners to license a set of their patents to one another or to third parties." Josh Lerner and Jean Tirole, Efficient Patent Pools, The American Economic Review, Vol.94, No. 3, June 2004

that are managed by an intermediate figure, the patent pooler.

The Patent pool facilitates the use of knowledge, and so reduces the effects of the tragedy of anti-commons in the field of intellectual property.

Moreover it establishes the licensing agreements, and the set of companies that are part of it, using them to be able to get the opportunity to take advantage of fragments of knowledge of others and earn returns from its patents.

It seems that the Patents Pools are the best solution to solve the problem of the tragedy of anti-commons, but it is necessary to perform an empirical analysis in order to understand if the pools can adversely affect welfare by reducing the incentives toward product developments and product market competition or if they can be welfare enhancing.

And additionally the controversial position of the antitrust law regarding the competition law enforcement of patents

pools could seriously damage the technology development as said in the words of Skitol and Wu:

> *"…Today's rules warrant fresh thinking: they are too rigid in some respects and inadequately protective in other respects. In short, sound and effective antitrust policy toward patent pools should be considered a work in progress; one size does not fit all pools in all market contexts or at all stages of their development, and there is a need for more sensitivity to variability in their competitive effects".*[11]

[11] Robert Skitol and Lawrence Wu, "A transatlantic swim through patent pool: keeping antitrust sharks at bay," estract from the book "On the merits: Current Issues in competition and law policy :Liber Amicorum Peter Plompen" by Paul Lugard and Leigh Hancher, Intersentia nv, 2005

2.1. Definition of the patents

Patents are the most important legal tools for protecting intellectual property rights[12].

An inventor through the patent has the right to exclude others from the economic usage of the innovation within the limits.[13]

There are three types of patents:

---

[12] "For many years, economists tipically conceptualized patents as well-defined property rights giving their owners either a monopoly over some market or at least a significant competitive advantage in the market due to control over a product improvement or a low-cost method of production (Nordhaus,1969; Reinganum, 1989)." Mark A.Lemley and Carl Shapiro, Probabilistic Patents, The Journal of Economic Perspectives Vol. 19, No. 2 (Spring, 2005)

[13] "The U.S. Supreme Court has consistently and adamantly held that patents do not require patentees to use or commercialize their inventions. Rather, patents simply grant inventors the right to exclude others from using or producing their inventions. That exclusive right, once granted, cannot be taken away because of a right holder's failure to work the patent. Great societal harm results, however, when patentees fail to commercialize their patents or deliberately and strategically suppress technologies purely for financial gain." Neil s. Tyler, "Patent nonuse and technology suppression: the use of compulsorylicensing to promote progress" University of Pennsylvania Law Review, 2014

1) **Utility patents:** may be granted to anyone who invents or discovers any new and useful process, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof;
2) **Design patents:** may be granted to anyone who invents a new, original, and ornamental design for an article of manufacture;
3) **Plant patents:** may be granted to anyone who invents or discovers and asexually reproduces any distinct and new variety of plant. [14]

An innovation, in order to be patentable, should be original, so it must not be already in the public domain, and obviously it have to be useful allowing the solution of a particular problem in at least one application.

According to the U.S. Patent Act. 35 U.S.C., enacted by Congress under its Constitutional grant of authority in order

[14] See http://www.uspto.gov/patents-getting-started/general-information-concerning-patents

to secure limited times to inventors the right to their discoveries; there are five main requirements for patentability:

1) Patentable subject matter requirement, according to which the type of inventions that could be protected "*are broadly defined as any process, machine, manufacture, or composition of matter or improvement thereof."*

   Products of nature, living or not, and human-made inventions are the pertinent differences between patentable and unpatentable subject.

2) Utility, as I said before the invention should be useful. The Patent and Trademark Office has developed guidance for determining the utility requirements. It seems there are four kind of Utility:

   Credible Utility *"Where an applicant has specifically asserted that an invention has a particular utility, that assertion cannot simply be dismissed by Office personnel as being "wrong"".*

Specific Utility *" A utility that is specific to the subject matter claimed"*

Substantial Utility *" A utility that defines a "real world" use".*

Well-established utility *" A specific, substantial and credible utility which is well known, immediately apparent, or implied by the specification's disclosure of the properties of a material, alone or taken with the knowledge of one skilled art".*

3) Novelty, that requires two distinct conditions: it needs that "*the invention was not known or used by others in this country, or patented or described in a printed publication in this or another country, prior to invention by the patent applicant".* And the statutory bars to patentability that "*applies where the invention was in public use or on sale in this country, or patented or described in a printed publication in this or another country more than one year prior to the date of the application for a U.S. patent".*

4) Non-obviousness. The non-obviousness was added by the Congress in order to test patentability with the enactment of the Patent Act of 1952. This test asses: *“whether the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious to a person having ordinary skill in the art at the time the invention was made”.*

5) Enablement requirements is directly relative to the specification, or disclosure, which must be included as part of every patent application. *"The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains...to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention."*

Beyond the legal prospective there is also an economic positive prospective linked to the Patents.

In fact according to Fritz Machlup 's paper " *an economic review of patent system*" there are four main theories highlighting the economic advantages of patents[15].

The first one is *the invention-inducement Theory* that says patents provides motivation for useful invention, in fact it presumes that without patents protection there will be no invention, and so that stronger protection will increase the amount of invention.

The second theory is *the Disclosure Theory* according to which Patents enable broad knowledge about and use of inventions by inducing inventors to release their inventions when otherwise they would rely on secrecy.

The third one is the *Development and Commercialization theory.* The patent is seen as providing the assurance that if the development is technological successful, its economic

[15] Fritz Machlup, An economic review of the patent system, Study commission by the Subcommittee on Patents, Trademarks, and Copyrights of the Committee on the Judiciary, U.S. Senate, 85th Congress, second session. Washington, D.C., 1958.

rewards will be achievable, thus inducing a decision to develop it.

The last one is the *Prospect Development Theory*; it proposes that the utility of a patent comes after an initial investment is made. So this theory assumes that if an initial invention is available as input, a vast rage of developments might be born.

But there is also the negative side of the Coin regarding Patenting Innovation.

In the Paper *"Patent Failure: How judges, bureaucrats and lawyers put innovators at risk"*, James Bessen and Micheal J. Meurer show how in the software and technology industries there are so many patents that it has become increasingly costly for technology and software developers to search for and discover whether products they aim to create are

already patented[16].

Actually for developers figure out if patents exist for abstract products or simply understand the boundaries of several patents means spending significant resources and time in realizing if they infringe some existing patents.

Furthermore authors believe that in the case of intellectual property, even an attorney's best guess at the boundaries of a patent is not certain, because definitively it is the court that decide whether or not one patent or product infringes on the pre-existing patents.

Besides they believe that the current system fails to offer incentive for innovation, arguing that the increasing costs of patenting new technology, including research, development,

---

[16] " Property rights can fail when their validity is uncertain... Property rights can fail when rights are so highly fragmented that the costs of negotiating the rights needed to make an investment become prohibitive... Property can fail when boundary information is not publicly accessible."James Bessen and Micheal J. Meurer, "*Patent Failure: How Judges, Bureaucrats, and Lawyers put Innovators at Risk*", 2008, Princeton University Press

and litigation costs, discourages innovators from investing in creating products and technology. In this case the smallest companies are very disadvantaged, being not able to afford the cost of obtaining new patents (given the possibility of potential litigation risks).

In fact the infringement penalty might discourage developers.

So in their opinion the patent system should be reformed and adjusted according to the needs of the developers.

In the end nowadays many technologies consist of multiple components, but the patens for each of these components could be held by a number of different firms. This was one of the hardest problem to solve, because if a company wants to use that specified technology in one of its products, it has to negotiate separately with each of these firms to set licencing terms.

This transaction could hardly imply that no-one will be entitle to use that particular technology.[17]

Therefore, these firms, owners of the patens, jointly agree to pool all their relevant patents, basically creating one organisation that becomes the central point for licencing the whole technology.

[17] Nordhaus identifies the trade-off between strong incentives to inventors through long-lived patents and the deadweight loss from a monopoly distortion caused by long-lived patents.

2.2. Definition of Patent Pool

> *" Technology pools are defined as arrangements whereby two or more parties assemble a package of technology which is licensed not only to contributors to the pool but also to third parties. In terms of their structure technology pools can take the form of simple arrangements between a limited number of parties or of elaborate organisational arrangements whereby the organisation of the licensing of the pooled technologies is entrusted to a separate entity. In both cases the pool may allow licensees to operate on the market on the basis of a single licence."*[18]

Over the past decades an uncountable number of patents are born, mostly in the software, semiconductors and biotechnology fields.

[18] See http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.C_.2014.089.01.0003.01.ENG Point 244

According to the world intellectual property organization, in the 2013, there were granted 2567900 patents in the entire world, of which 352184 in Europe, 607710 in North America and 1497166 in Asia.[19]

The proliferation of the patents have had a detrimental effect on the social welfare as it becomes very harshly to commercialize advanced technologies made up by thousand of different patents.

The aim of the patent pool[20] is the gathering of all this patents in one association that could respond to the diffusion of intellectual property rights.

The pool was denoted by William Z. Ripley as " *the oldest, the most common and at the same the most popular, mode of obviating the evils of competition".*[21]

---

[19] See http://ipstats.wipo.int/ipstatv2/IpsStatsResultvalue

[20] "The novel "pool-of-pools" is the most sophisticated. It aims to facilitate the market adoption of complex products. " Simon Den Ujil, Rudi Bekkers, Henk J.DE Vries "Managing Intellectual Property Using Patent Pool: lessons from three generations of pools in the Optical Disco Industry", 2013, California mangement review vol55N°4.

[21] William Z. Ripley, "Trust, Pools and Corporations", Boston, Ginn & Company, 1916

A patent pool could be defined as an agreement among multiple patent holders to conglomerate their patents.[22]

Often Patent pools are associated with very complex technologies that necessitate complementary patents in order to offer effective technical solutions.

Pools represent the source for the industrial benchmarks that supply firms with the indispensable technologies to develop compatible products and services.

But obviously they carry with them costs in building it and negotiating its organizational structure and above all the royalty' rates.

Those costs and other factors, that I am going to analyze later, influence the choice of a patent owner to join or not a pool.

In order to better understand how a pool works, it could be useful to analyze its history.

[22] "A Patent pool is an arrangement in which "two or more patent owners agree to license certain of their patents to one another and/or third parties". Ted J. Ebersole, Marvin C.Guthrie, and Jorge A. Goldstein "Patent Pools as a Solution to the Licensing Problems of Diagnostic Genetics", January 2005, Intellectual Property and Technology Law Journal.

But before proceeding, it is important to define exactly an acceptance standard definition of cross-licensing and patent pools, as will mentioned in the history.

“By "cross-licensing," I mean the interchange of intellectual property rights between two or more persons. By "patent pool," I mean the aggregation of intellectual property rights which are the subject of cross licensing, whether they are transferred directly by patentee to licensee or through some medium, such as a joint venture, set up specifically to administer the patent pool. “[23]

The first patent pool was born in North America in 1856 by Sewing machine manufacturers.

Orlando B. Potter, lawyer and president of the Grover and Baker Company, proposed the idea of the Pool in Albany, New York, during a meeting of major manufacturers.

Through this mean Grover, Baker, Singer and Wheeler & Wilson put an end to mutual accusation of patent infringement, in order to pool their patents.

---

[23]See Joel I. Klein, An Address to the American Intellectual Property Law Association, on the subject of cross licensing and antitrust law, (2 May 1997).

Thanks to that each manufacturer could licence all the patents for a fee of fifteen dollars per machine.[24,25]

One of the principal patent pools was created in the automobile sector.

The patent infringement in that sector was a serious problem.

In 1829 George B. Selden filed a patent application for a vehicle made by internal combustion engine operating on hydrocarbon fuel combined with broadly defined chassis components.[26]

Through legal manoeuvring, he succeeded in delaying effective date for the patent by 16 years old, when automobiles were attracting more attention.

---

[24] journal of Economic Hystory 433 and Grace Rogeers Cooper, The Sewing Machine: its Invention and Devolpment, 2nd ed., Washington, D.C., Smithsonian Books, 1977.

[25] "The unparalleled success of Sewing Machines has induced several fraudulent imitations of them", Ryan L. Lampe and Petra Moser, "Do the patent pools encourage innovation? Evidence from the 19Th-century Sewing machine industry", June 2009, NBER Working Paper Series

[26] See http://americanhistory.si.edu/collections/search/object/nmah_1305689

During 1900 Selden's Company accused The Winton Motor Carriage Company of Cleveland, Ohio (in that period the biggest maker of gasoline in the U.S.), of Patent infringement. In the 1905 a patent-pooling association of auto manufacturing companies demanded and received royalties from other manufacturers for the right to produce Selden's invention.

This pool called A.M.A. Automobile Manufacturers Association, was made up by seventy-nine companies controlling almost 350 patents, growing until be composed by two hundred members and 547 patents in the1925, and over one thousand patents by 1932.[27]

---

[27] Ford was actually refused entry into AL.AM. The other members claimed he was merely an assembler - not a manufacturer - of automobiles, and therefore should be excluded. See Edward D. KENNEDY, The Automobile Industry: The Coming of Age of Capitalism's Favorite Child, New York, Reynal & Hitchcock, 1941, p. 45. Because he was not a member, Ford could not use the patents on the Dyer patents for the sliding gear transmission that was held by the AL.AM. pool. Consequently, he used the planetary transmission in his Model T and earlier cars. As a precautionary measure, took out a license in 1905 from the man who claimed to be its inventor. See William GREENLEAF, Monopoly on Wheels: Henry Ford and the Selden Automobile Patent, Detroit, Wayne State University Press, 1961, p. 243.

Two other pool were created for the radio and the aircraft patent

Both the two patent pool were made during the World War I. The former was relative to the patents for radio transmitters and receivers detained by an uncountable number of companies including British Marconi, American Marconi, General Electric (GE), Westinghouse, American Telephone and Telegraph (AT&T), Lee De Forest and Edwin Armstrong. For radio to progress in the future would require the pooling of these patents among economic competitive rivals.

During the first War World all these companies pooled their discoveries in order to develop a better radio system that could help the United States Navy that have already taken over the control of all the commercial radio stations.

At the end of the War the U.S. Navy choose to not be anymore responsible for this patent infringement law suits. This soon lead to patent problem, but in the end the solution was found through a cross licensing of patents. The radio industry was divided up with AT&T's Western Electric

subsidiary manufacturing radio transmitters, GE and Westinghouse manufacturing radio receivers or equipment, and RCA selling the radio receivers and equipment.[28]

Instead the latter was about the manufacturer's Aircraft Association. A pool formed by the Wright Company and the Curtiss Company.

Both companies had blocked the building of new airplanes, which were needed for the United States that was entering World War I.

Franklin D. Roosvelt acted as mediator to pressure the industry to form a cross-licensing organization, the so-called Manufacturer's Aircraft Association.

All aircraft manufacturers had to join the association, and each member was obliged to pay a small blanket fee, in order to use the aviation's patents, for each airplane manufactured.

[28] See https://pronkpapers.wordpress.com/tag/general-electric/

The major part of the fees would go to the Wright-Martin and Curtiss companies, until their respective patents expire.[29]

During the 1900 even in Europe several important patent pools were signed. The most notable were the A.E.G., the cooperation between Siemens and Halske, and the Drahtkonzern, the German Gas-Burner Company agreement. In the 1921, a group of European lamp manufacturers entered into a cross licensing agreement, and were joined by the American General Electric and the Osram Company, Another similar agreement of cross licensing was signed in 1932, between Imperial Chemical Industries, the I.G. Ferbnindustrie A.G., the National French and three Swiss companies.

After the War many cartel agreements were undertaken between German companies and United States companies.

[29] See http://en.wikipedia.org/wiki/Wright_brothers_patent_war

The leitmotiv for the formation of the patent pools in those years was to overcome the slow innovation due to the existence of blocking patents.

With the formation of all these pools emerged different problems. Many patent pools were born "*as a mechanism for cartels to engage in collective price setting or output restrictions".*[30]

The court had to impose appropriate limits on such abuses that were destroying many markets and that were ruined the social welfare.

Through the Sherman Act, the court laid down some guidelines, continuing to monitor and strike down patent pooling arrangements in different industries.

One example of this new policy was the abolition of the glass manufacturing patent pool, the Hartford-Empire.

[30] See Dorothy Gill Raymod, "Benefits and Risks of Patent Pooling for Standards Setting Organizations", 2002 16 Antitrust 41, 41.

This pool forced competitors to sell out to the pool and stipulate a price-fixing agreement, allowing the industry to maintain high prices despite improvements in technology.
During the 1960s the United States Department of Justice started to articulate its antitrust policies in order to repress hostile and anticompetitive behaviours caused by the patent licensing agreements.
All the above-cited guidelines were included in the publication by the Department of Justice "Nine-No-Nos"[31], regarding patent licensing.
After the publication of these guidelines, firms were more sceptical to form pools in view of the inflexible line policies adopted by the DoJ.

The Nine No NOs, nine specified licensing practices that the division viewed as anticompetitive restraints of trade in licensing agreements, were:

[31] See Bruce B. Wilson, Deputy Assistant Attorney Gen., Remarks before the Fourth New England Antitrust Conference, Patent and Know-How License Agreements: Field of Use, Territorial, Price and Quantity Restrictions (Nov. 6, 1970).

1. Royalties not reasonably related to sales of the patented products;

2. Restraints on licensees' commerce outside the scope of the patent (tie-outs);

3. Requiring the licensee to purchase unpatented materials from the licensor (tie-ins);

4. Mandatory package licensing;

5. Requiring the licensee to assign to the patentee patents that may be issued to the licensee after the licensing arrangement is executed (exclusive grant backs):

6. Licensee veto power over grants of further licenses;

7. Restraints on sales of unpatented products made with a patented process;

8. Post-sale restraints on resale;

9. Setting minimum prices on resale of the patent products. [32]

In the 1980s the Antitrust Division started to question to the theoretical formation of the Nine No-No's.

According to that division of the DoJ the unconstrained patent licensing raises the value of patents and encourages licensing and innovation.

The results emerged in the 1988 in the issuance " Antitrust Enforcement Guidelines for International Operations", followed in the 1995 by "Antitrust Guidelines for the licensing of Intellectual property".

The former adopted a policy aimed at balancing the pro-competitive effects of licensing against possible anticompetitive effects in related markets.

The fundamental principle of these guidelines was that the owner of the Intellectual Property rights is authorized to maximize the market value of its patent, but, at the same

[32] See Richard Gilbert & Carl Shapiro, "Antitrust Issues in the licensing of Intellectual Property: The Nine No-No's Meet the Nineties", 1997, Brookings papers on Econ. Activity, Microeconomics

time, it did not explain how a patent's holder could control demand for its Intellectual Property.

Instead the latter provided three core principles:

- An explicit recognition of the generally pro-competitive nature of licensing arrangements;

- A clear rejection of any presumption that intellectual property necessarily creates market power in the antitrust context; and
- An endorsement of the validity of applying the same general antitrust approach to the analysis of conduct involving intellectual property that the agencies apply to conduct involving other forms of tangible or intangible property.[33]

According to the guidelines, patent pools are tolerable and pro-competitive when they integrate complementary

[33] See Richard Gilbert & Carl Shapiro, "Antitrust Issues in the licensing of Intellectual Property: The Nine No-No's Meet the Nineties", 1997, Brookings papers on Econ. Activity, Microeconomics

technology, reduce transaction costs, clear blocking patents, avoids infringement litigation, and promote the spreading of technology.

With the development of new technologies, the pools in the 1990s re-emerged, probably the more discussed and famous was the one of the MPEG-2 Standard by the Moving Picture Experts Group of the International Standards Organization and the International Electrotechnical Commission.

The MPEG-2 pool has been established as agreement between nine patent holders to combine twenty-seven patents, where the administrator is an independent, external organization knows as the MPEG Licensing Authority. The aim of this pool was to meet the international standard known as MPEG-2 video compression technology. Nowadays, the pool has over a hundred patents and thousands of licenses. The MPEG-2 Patent Portfolio License was created to "*provide a service that brings all parties together so that technical innovations can be made widely*

available at a reasonable price. Utilizing their collaborative approach, they help make markets for intellectual property that maximize profits for intellectual property owners and make utilization of intellectual property affordable for manufacturers, consumers and other users".[34]

Another big pool formed in those years was the DVD-ROM and DVD-Video Formats[35], suggested by Philips, Sony and Pioneer and than made along with Hitachi, Matsushita Electric Industrial, Time Warner, Victor Company of Japan and Mitsubishi Electric Corporation.

The objective of this pool was to comply with the standards for the production of DVDs and DVD players.

After having been adopted in the industry the pool has facilitated the acceptance of products using DVD technology.

---

[34] See http://www.mpegla.com/main/Pages/About.aspx

[35] Simon Den Ujil, Rudi Bekkers, Henk J.DE Vries "Managing Intellectual Property Using Patent Pool: lessons from three generations of pools in the Optical Disco Industry", 2013, California mangement review vol55N°4.

The last patent pool to analyze is about telecommunications technologies. But I prefer to talk about this in the last chapter of this thesis.

As we have seen during the history the birth of the pool was hampered by the Department of Justice, even if the formation of some structural pool could lead to a potential benefits and efficiencies for the total welfare.

But in many cases the anticompetitive behaviour used by the Companies, joined into the pool, had destroyed the competition in the market, making the price higher and the consumers worse off.

2.3. Nature and different categories of Patens and Patent Pools

Whether patent pool may trigged antitrust examination depends, among the nature and the concerned technologies of the patents.

The nature of the pooled technologies differentiate the patents according to as complementary or substitutes, and in a standard setting environment, as essential or non-essential.

Let's start with substitute and complementary patents.

Two patents are considered substitutes if they cover alternative technologies and are no-blocking, that means that the use of patent in a particular technological field does not prevent the use of another patent in the same field because it relies on a technology not covered by the first patent.

The substitute patents allow the use of some technologies covered by them without overstepping the other patents.

Definitely substitute patents are competing with each other. According to the United States Patent and Trademark Office substitute patents are defined as:

"An application which is in essence a duplicate of a prior (earlier filed) application by the same applicant abandoned before the filing of the substitute (later filed) application; a substitute application does not obtain the benefit of the filing date of the prior application".[36]

Instead a complementary patent, as the same word says, must be used together in order to produce a specific output and are not substitute for each other.

In the production process, complementary patents are necessary for the development of new technologies.

From the competition point of view is indispensable to distinguish between substitute and complementary patents, because substitute patent could not be bundled in a pool,

[36] See http://www.uspto.gov/web/offices/pac/mpep/s201.html

otherwise the technology, between these substitute patents, would be destroyed.

Instead complementary patents, even if bundled in a pool, do not incur in technology damage, on the contrary according to the U.S. and the Europe antitrust enforcement the pool between complementary patents is pro-competitive.

For this reason all the antitrust agencies have to supervise the pool formation, and they have to watch over if the pool will be composed by substitute or complementary patents.

An example perfectly in line with this policy was the Summit VS VISX case[37], in which the Federal Trade Commission thought that the pool could restrict competition and raise prices.

The two companies were working on technology for performing laser eye surgery, and managed to protect their own patents, that were not available in the market (Instead

[37] Federal Trade Commission. [1999], In the matter of Summit Technology, Inc. and VISX, Inc. Docket No. 9286.

of competing each other).

Obviously the results were higher prices and limited choice for consumers.

The FCF after having examined the case, established that the two patents were substitute and not complementary, stopping the pool.[38]

However the complementarity could damage technology too, according to Thomas D. Jeitschko & Nanyun Zhang, in their paper *"Adverse effect of Patent Pooling on Product Development and Commercialization"*, patent pool may discourage future investments in R&D by outside companies, if they increase the threat of litigation.[39]

But I am going to talk about it later.

---

[38] See https://www.ftc.gov/news-events/press-releases/1998/08/summit-and-visx-settle-ftc-charges-violating-antitrust-laws

[39] See Thomas D. Jeitschko & Nanyun Zhang, Adverse Effects of Patent Pooling on Product Development and Commercialization，April 2013, Dusseldorf institute for competition economics

The other difference to point it out is the one between the essential patents and no-essential ones, which is strictly related to the complementarity and substitutability.

The essential patents are by nature complementary and they should and could be included in a pool.

By definition an essential patent is a patent that claims an invention that must be used to comply with technical standard.[40]

So to conclude, it's necessary to recognize the distinction between complementary and substitute patents, and the one between essential and nonessential, and a patent pool will be considered pro-competitive if it includes only complementary or essential patents whereas it would be judged to cause anticompetitive risks otherwise.

This discussion makes arise some problems:

[40] See Shapiro, Carl, "Navigating the Patent Thicket: Cross Licenses, Patent Pools, and Standard-Setting", forthcoming Innovation Policy and the Economy, Volume I, MIT Press, 2001

First of all the concept of essentiality is unclear, in both the case of patent pools outside the standards and the case of standard-related patents pools.

The second problem is the dual definition of "an essential patent".

In fact, the antitrust commission have to evaluate *ex ante* and *ex post,* the essentiality of the patents, but a 'technically essential' patent cannot lose its essentiality, even if a competing patent emerges, as long as the standard specification remains unchanged. [41]

The third problem is about the concept of complementarity, which is ambiguous too, and it is not well defined by the public authorities in each jurisdiction.

Before I have mentioned the standard case of patent pool,

[41] See Peter Plompen, The New Technology Transfer Guidelines (TTG) as Applied to Patent Pools and Patent Pool Licensing: Some Observations Regarding the Concept of "Essential Technologies, in European Competition Law Annual 2005: The Interaction Between Competition Law And Intellectual Property Law 295, 299 et seq. (Claus Dieter. Ehlermann & Isabel Atanasiu eds., Hart Publishing 2007).

hence it is compulsory to clarify this concept.

"A technical standard is an established norm or requirement in regard to technical systems. It is usually a formal document that establishes uniform engineering or technical criteria, methods, processes and practices."[42]

Standards are essential in the creation of new technologies. Indeed the relation between standards and Patent pools is based on the evolution and the development of new technologies.

According to the Department of Justice, under the antitrust law, the norms to follow are[43]:

1. Patents must be clearly identified and should be available for licensing individually as well as in a package as chosen by a potential licensee;

2. The patents in the pool must be valid and must not have been expired;

[42] See http://en.wikipedia.org/wiki/Technical_standard
[43] These norms were prepared essentially to respond to the MPEG and DVD proposals.

3. Limitation to patents that are technically essential which, by definition, are not competing, and use of an independent expert to assess whether a patent is essential;

4. The patent pool should have limited duration;

5. The royalties proposed by the arrangements should be reasonable;

6. Availability of worldwide non-exclusive licenses;

7. Freedom of licensees to develop and use alternative patents;

8. Requirement that licensees grant back non-exclusive, non-discriminatory licenses to use patents that are essential to comply with the technology;

9. The pool participants must not collude on prices outside the scope of the pool, e.g., on downstream

products. [44]

The nature of the pool patent is not the only aspect to analyze; actually another aspect is the one relative to the different categories of existent pool.

The Patent Pools are usually divided into three categories, depending on the inter-relations between the patents in the pool, so their nature.

The first category joins all the competitive patents, the ones that are an alternative to each other. The aim of this pool is to harmonize this kind of patents.

The second category gathers the patents related to the same technology. These patents are not substituting each other and the goal of these pools is to make the patents more valuable, therefore the principle followed is that the unity is

[44] See Richard J. Gilbert "Antitrust for Patent Pools: A century of Policy Evolution" 2004 Stan. Tech. L. Rev. 3,1,

strength.

The third one and also the last one is often used to strengthen blocking patents.

A typical example of a blocking patent scenario is as follows:

> *"A obtains a patent on a new product, such as a new drug. Several years later, B discovers a new process for using A's drug, and this discovery constitutes a patentable invention itself (the process is novel, non- obvious, and has utility). The resulting two patents held by A and B covers overlapping aspects of the same invention: (i) the drug and (ii) a particular process for using the drug. A can thus exercise her right to exclude B from using her patented drug in commercially exploiting his new process, regardless of B's inventive act in discovering a new use for A's drug. In this situation, A has a "blocking patent," because she can block B's use of his own-patented process. (B can also exclude A from using his process, but A has the greater scope of exclusivity here, because she has a prior*

claim in the product, which she can continue to use as long as she avoids B's patented process.) "[45]

The blocking patent's aim is to grant the patent owner the right to exclude others from using his discoveries[46].

As it was said before the distinctions between the different pools is a matter of fact, because while the complementary and the blocking pools could improve the technologies development, avoiding litigations[47], at the contrary the ones formed by competing patents could eliminate alternative, raise prices and finally lead to antitrust problems.

---

[45] See Adam Mossoff "Exclusion and Exclusive Use in Patent Law", *Harvard Journal of Law &Technology,* Volume 22, Number 2, Spring 2009

[46] *"patents have multiple purposes, with strategic motives, such as blocking competitors and preventing suits, usually being amongst the top motivations to patent, right after the traditional motive of protecting inventions from imitations."* Cohen, M. W., Nelson, Richard R., Walsh, J.P. Protecting their Intellectual Assets: Appropriability Conditions and Why U.S,. Manufacturing Firms patent (or Not). NBER Working Paper No. 7552, February 2000.

[47] *"Pools including only patents which are complementary and necessary for implementing a technology furthermore eliminate wasteful multiple margins "* J. Lerner and J. Tirole. Efficient patent pools. American Economic Review, 94(3):691–711, June 2004.

Another distinction is the one between the two categories of licensing, which are closely connected to the pools.

1. Newly, the cross-licensing[48] is an agreement according to which two or more parties grant a license to each other for the exploitation of the subject-matter claimed in one or more of the patents each owns[49].

   It is an alternative method to solve the problem of blocked innovations caused by overlapping patent rights.

   Many companies, owning overlapping patents, in order to achieve access to additional patented technology licence their ones.

---

[48] D. Spulber in his" *Innovation economics: The interplay among technology standards, competitive conduct, and economic performance*", Journal of Competition Law and Economics, 9(4): 777–825, December 2013, analyzed the pools as cross-licensing agreements.

[49] See Shapiro, Carl, *"Navigating the Patent Thicket: Cross Licenses, Patent Pools, and Standard Setting" Innovation Policy and the Economy*, MIT Press2001, p119 et seq.

2. The standard-setting[50] is a cooperation that often involves horizontal competitors agreeing on certain specifications of the products they plan to market, implicating core antitrust issues regarding the boundary between cooperation and collusion.[51] Many companies have established standard conditions for manufacturing a certain product: above all standardisation is very common in the video, communications and data areas. Obviously the patent pool could fix the problem of the negotiation in the standard setting. In fact without a pool each company should negotiate to an uncountable number of other companies, holding different licenses, to develop a particular technology.

---

[50] Raymond D.G.," Benefits and risks of patent pooling for standard-setting organisations", 2002

[51] See Joseph Farrell, John Hayes, Carl Shapiro, Theresa Sullivan, "Standard Setting, Patents, and Hold-Up", Antitrust Law Journal Vol.74 No. 3 (2007). Copyright 2007 American Bar Association.

2.4. The main problem the pools have to solve: the tragedy of Anti-commons.

During the introduction I have mentioned the Anti-commons, since the tragedy of Anti-commons[52] is the main problem that the pools solve, I would like to enforce this discussion. This phenomenon occurs when the coexistence of multiple veto rights creates conditions for the optimal use of a common resource[53]. If the resource is subject to veto rights held by two or more individuals, each owner will be encouraged to threaten the use of his right to obtain the best possible use of the asset. During the transaction, the veto allows requiring the maximum share of surplus contract;

---

[52] *"The Anticommons Is Not Necessarily Tragic"* Michael A. Heller, "The Tragedy of the Anticommons: Property in the Transition from Marx to Markets , 1998, Harv. L. Rev. 111, no. 3

[53] M.A. Heller, *The Tragedy of the Anticommons: Property in the Transition from Marx to Markets*, 111 Harv. L. Rev. 621 (1998); M.A. Heller - R.S. Eisenberg, *Can Patents Deter Innovation? The Anticommons in Biomedical Research*, 280 Science 698 (1998).

this can prevent the trading and the passage of the good to the subject who evaluates it more, with a consequent inefficiency.

The world “Anti-commons” was coined by Frank Isaac Michealman in his article *“Ethics, economics and the law of property”,* he has defined the Anti-commons as *“ a type of property in which all parties have an exclusive right over the good, and no one, therefore, has the privilege of using the property unless authorized by others. "*[54]

In a nutshell the tragedy of Anti-commons is a type of coordination breakdown, in which a single resource has several rights owners who preclude others form using it, frustrating what would be a socially required result.

The tragedy of the “anti-commons” covers a range of coordination failures such as: patent thickets and submarine patents.

[54] See F.I.Michelman, *“Ethics, economics, and the law of property”,* 24 Nomos 3 (1982)

1) A patent thicket: *" an overlapping set of patents rights requiring that those seeking to commercialize new technology obtain licenses form multiple patentees. The patent thicket is especially thorny when combined with the risk of holdup, namely the danger that new products will inadvertently infringe on patents issued after these products were designed".*[55]

   So the main problem is that patent thickets block entry to some markets and above all inhibit innovation.

2) A submarine patent[56] is a patent whose issuance and publication are deliberately deferred by the applicant for several years.

---

[55] See Carl Shapiro, " *Navigating the Patent Thicket: Cross Licenses, Patent Pools, and Standard Setting",*

[56] See Stuart Graham and David Mowrey. *Submarines in software? continuations in us software patenting in the 1980s and 1990s*. Economics of Innovation and New Technology

The US Mr. Kantor, the newly elected Republican Senate majority for the GATT Uruguay Round Implementation Act, defined Submarine Patents as Patents that issue after a long pendency artificially maintained by the applicant, and then used to hold to ransom industries that have matured on the basis of technology during such prolonged application pendency.

Their main problem is that they seem to do not exist.

3. Regulation policy towards patents pool

The public policy toward patent pools progressively moved from an extreme permissive approach in the early twentieth century to an absolute opposition in the middle of the century.

During the nineties the regulator authorities faced the discussion about patent pool in a more favourable light. Indeed, Patents pools are no longer treated as collusive agreements among potential competitors, but they still raise a number of concerns that have to be handled by the competition authorities in order to strengthen their utilization and their utility.

I am going to analyze the U.S. Department of Justice regulations, the European Commission guidelines and the Japanese Fair Trade Commission.

3.1. United States Policy

In 1995 the Department of Justice and the U.S. Federal Trade Commission issued the *"Antitrust Guidelines for the licensing of Intellectual Property"*.

According to this guideline the cross licensing and pooling arrangements may *"provide pro-competitive benefits by integrating complementary technologies, reducing transaction costs, clearing blocking positions, and avoiding costly infringement litigation"*[57].

One of the key points highlighted by the Guidelines is that in order to be considered lawful, a pool of intellectual property rights with collective price setting or coordinated output restrictions, should contribute to an *"efficiency-enhancing integration of economic activity among the participants"*[58].

The second main point is about horizontal competitors involved in a cross-licensing agreement.

[57] See http://www.justice.gov/atr/public/guidelines/0558.htm#t23
[58] See http://www.justice.gov/atr/public/guidelines/0558.htm#t23

If the effect of the settlement is to reduce competition among entities, the Agency has to consider the agreement as unlawful for the limitation of trade.

The third principal point is about companies that would like to be part of an already formed pool.

According to the U.S. guideline *"Pooling arrangements generally need not be open to all who would like to join. However, exclusion from cross-licensing and pooling arrangements among parties that collectively possess market power may, under some circumstances, harm competition".*[59]

This means that an exclusion from a pooling does not have anticompetitive effects unless the excluded companies could not compete in the relevant market for the good including the licensed technology and at the same time the pool members co-operatively hold market power in the relevant market.

[59] See http://www.justice.gov/atr/public/guidelines/0558.htm#t23

In this case the agency is encouraged to intervene in order to limiting the agreement that could damage the efficient technology development.

The last key point is about retarding innovation.

Indeed if the pooling arrangement deters and discourages participants from engaging in research and development, the agency will prompt interfere to block it.

An example taken by the guideline is *"a pooling arrangement that requires members to grant licenses to each other for current and future technology at minimal cost may reduce the incentives of its members to engage in research and development because members of the pool have to share their successful research and development and each of the members can free ride on the accomplishments of other pool members".*[60]

The only quibble that makes it lawful is when it has precompetitive benefits by exploiting economies of scale and

[60] See http://www.justice.gov/atr/public/guidelines/0558.htm#t23

integrating complementary capabilities of the pool members.

3.2. EU policy

In Europe, granting Intellectual property rights is still done at a national level, for this reason it is difficult to state the interrelation of the Intellectual property right and competition policy.

Nowadays the European legislation is gradually evolving. This new legislation covers trademarks, the harmonisation of the term of protection of copyright, the legal protection of databases, biotechnology inventions and designs. The Commission has recently adopted a proposal for a Council Regulation on the Community Patent.

Moreover, Art. 101 of the Treaty on the functioning of European Union to categories of technology transfer agreements involve the Commission to respect national systems of property ownership and Art. 30 of the Treaty provide exclusion from the free movement provisions if a conflict with national Intellectual Property Rights emerges.

Furthermore, the European Court of Justice has emphasized the importance of the principles of competition and even free movement inside the Community, and then it has established a distinction between the grant and existence of the Intellectual Property Rights, which cannot be affected by the rules of free movement and competition and its usage.

According to the competition provision of the treaty, the Intellectual Property Right cannot be overruled, indeed a proprietorship of an Intellectual Property Right gives the owner the right to license and ask for royalties. But the European Court of Justice and the Commission have always pondered that the conditions of license may fall under Art. 81 and 82 of the Treaty. Art. 82 lay down that the conditions of a license might not discriminate between licensees and the royalties should not be disproportionate.

The main difference between the U.S. and the European approach in the field of Intellectual Property Right is that the U.S. sets more restrictions on the possibilities that

competition authorities intervening against agreements between no competitors. It consequently gives the licensor much more opportunities to exploit its Intellectual Property Right when the licensing occurs between no competitors. The European approach admits the same intra-brand limitations but preserves the possibility of intervening when and where considered necessary. Categorically, the U.S. approach is more consistent approaching the licensing agreements between competitors.

Regarding patent pools, the EU law does not cover explicitly this argument.

But the Technology Transfer Regulation provides for a block exemption mechanism according to which certain agreements are exempted from the application of Article 101(1) of the Treaty on the functioning of the European Union provided that the market shares of the involved parties does not exceed 20% and other relevant criteria are met. Thus, irrespective of the market shares of the involved

undertakings, patent pools do not enjoy a safe harbour treatment. Rather, only the Technology Transfer Guidelines statement the analysis of patent pools under Article 101(1). However, individual licenses granted under a patent pool arrangement may fall under the Block Exemption and may therefore be exempted from the application of Article 101(1). [61]

The Technology Transfer Guidelines recognize that patent pools may have both pro and anti competitive effects:

Pro Competitive effect:

> *"Technology pools can produce pro-competitive effects, in particular by reducing transaction costs and by setting a limit on cumulative royalties to avoid double marginalisation. The creation of a pool allows for one-stop licensing of the technologies covered by the pool. This is particularly important in sectors where intellectual*

[61] http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2014.093.01.0017.01.ENG

property rights are prevalent and licences need to be obtained from a significant number of licensors in order to operate on the market. In cases where licensees receive on-going services concerning the application of the licensed technology, joint licensing and servicing can lead to further cost reductions. Patent pools can also play a beneficial role in the implementation of pro-competitive standards."[62]

Anti Competitive effect:

"Technology pools may also be restrictive of competition. The creation of a technology pool necessarily implies joint selling of the pooled technologies, which in the case of pools composed solely or predominantly of substitute technologies amounts to a price fixing cartel. Moreover, in addition to reducing competition between the parties, technology pools may also, in particular when they support an industry standard or establish a de facto

[62] http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.C_.2014.089.01.0003.01.ENG point 245

industry standard, result in a reduction of innovation by foreclosing alternative technologies. The existence of the standard and a related technology pool may make it more difficult for new and improved technologies to enter the market.[63]

Even in the European Guideline for Technology Transfer, a distinction between complementary, substitute, essential and non-essential patents is made.

"The competitive risks and the efficiency enhancing potential of technology pools depend to a large extent on the relationship between the pooled technologies and their relationship with technologies outside the pool. Two basic distinctions must be made, namely (a) between technological complements and technological substitutes

[63] http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.C_.2014.089.01.0003.01.ENG point 246

and (b) between essential and non-essential technologies."[64]

Besides, the definition of complementary and substitute is:

"Two technologies are complements as opposed to substitutes when they are both required to produce the product or carry out the process to which the technologies relate. Conversely, two technologies are substitutes when either technology allows the holder to produce the product or carry out the process to which the technologies relate."[65]

According to the guideline the distinction between complementary and substitute technologies is *"not clear-cut in all cases, since technologies may be substitutes in part and complements in part."*[66]

Like in the American guideline, the problem that is still

[64] http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.C_.2014.089.01.0003.01.ENG point 250
[65] See http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.C_.2014.089.01.0003.01.ENG point 251
[66] See http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.C_.2014.089.01.0003.01.ENG point 254

unsolved is that the implication of substitutability and complementarity is uncertain, even because many times technologies may be in part substitutes and in part complements.

But as the US guideline lay down, also the European guidelines establish that *"as a general rule the Commission considers that the inclusion of significant substitute technologies in the pool constitutes a violation of Article 101(1) of the Treaty".*[67]

Relatively to essential and no essential technologies, the guideline assumed *"A technology can be essential either (a) to produce a particular product or carry out a particular process to which the pooled technologies relate or (b) to produce such product or carry out such a process in accordance with a*

[67] See http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.C_.2014.089.01.0003.01.ENG point 255

standard which includes the pooled technologies. In the first case, a technology is essential (as opposed to non-essential) if there are no viable substitutes (both from a commercial and technical point of view) for that technology inside or outside the pool and the technology in question constitutes a necessary part of the package of technologies for the purposes of producing the product(s) or carrying out the process (-es) to which the pool relates. In the second case, a technology is essential if it constitutes a necessary part (that is to say, there are no viable substitutes) of the pooled technologies needed to comply with the standard supported by the pool (standard essential technologies). Technologies that are essential are by necessity also complements. The fact that a technology holder merely declares that a technology is essential does not imply that such a technology is essential according to the criteria described in this point."[68]

Also in this case, the European guideline slavishly follows

[68] See http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.C_.2014.089.01.0003.01.ENG point 252

the American one.

It is essential to highlight that the determination whether technologies are essential and non-essential is dynamic. A technology, even if initially considered essential, could become non-essential with the advancement of new technologies. Consequently the analysis, concerned patent pools, is dynamic too, and for this reason they require ongoing review in light of competition law.

3.3 Japanese guideline

The "*Guideline for the Use of Intellectual Property under the Antimonopoly Act"* provides guidance on the competitive analysis of patent pools in Japan.

The purpose of the Antimonopoly Act is *"promote fair and free competition, stimulate the creative initiative of enterprises, encourage business activity, heighten the level of employment and actual national income, and thereby promote the democratic and wholesome development of the national economy as well as secure the interests of general consumers by prohibiting private monopolization, unreasonable restraint of trade and unfair trade practices, preventing excessive concentration of economic power and eliminating unreasonable restraints on production, sale, price, technology, etc. , and all other unjust restrictions on business activity*

through combinations, agreements, etc."[69]

According to the guideline of Intellectual property, if there will not be a violation of the Antimonopoly Act, the patent pool is considered useful in encouraging the effective use and development of new technologies.

Nevertheless patent pools are considered an unreasonable restraint of trade in four situations:

a) Any conduct of inhibiting any other party from using the technology
b) Any conduct of licensing other parties to use the technology within a limited scope
c) Any conduct of imposing restrictions on activities conducted by other parties licensed to use the technology
d) Whether the business activities by entrepreneurs are conducted inside or outside Japan, the viewpoints

[69] See http://www.jftc.go.jp/en/legislation_gls/amended_ama09/amended_ama15_01.html

specified in the Guidelines apply, provided that the activities affect the Japanese market. [70]

Moreover the same Guidelines provide guidance as to when patent pools relating to standardization are deemed anticompetitive, the following actions are specified into the Guideline as a violation of the Antimonopoly act:

a) Restricting prices of new products with specifications;
b) Restricting the development of alternative specifications;
c) Unreasonably extending the scope of specifications;
d) Unreasonable excluding technical proposals from competitors;
e) Excluding competitors from the activities.[71]

[70] See http://www.jftc.go.jp/en/legislation_gls/imonopoly_guidelines.files/070928_IP_Guideline.pdf
[71] See http://www.jftc.go.jp/en/legislation_gls/imonopoly_guidelines.files/070928_IP_Guideline.pdf

Even in this case the guideline differentiates between essential and non-essential patents. The former are defined as those required to realize and implement the specific technical application at issue. Competitive issue are caused by non-essential patents, indeed according to the guideline, *pools that only consist of essential patents generally do not cause competitive concerns, provided that the assessment whether patents are essential is not arbitrary and should therefore be made by a third party with technical expertise.* [72]

The case related to the non-essential one has to be analyzed by the authority in order to not be violating the Antimonopoly act, in this case the pool might have pro-competitive effects.

[72] See http://www.jftc.go.jp/en/legislation_gls/imonopoly_guidelines.files/070928_IP_Guideline.pdf

4.Effects on Competition and Innovation

The effects of patent pools on competition may be positive or negative and it is still subject to debate.

While the theoretical literature, above all, the papers by Lerner and Tirole, Dequiedt and Versaevel, Schimdt, foresees a positive effect of pools on innovation encouragements, instead the recent empirical research, by for example Lampe and Moser, Joshi and Nerkar, and Flamm shows that the creation of several pools was followed by a decline in associated innovation activities, so it highlighted a negative impact derived by pool.

4.1.Pro-competitive effects

The positive effects that result from community patents (mainly between complementary patents) are: production efficiency, higher incomes and lower costs, by offering new products and creating new choice to the consumer[73]. Other advantages associated with, are: the possibility for the pool members to grant more licenses of individual patents to multiple applicants, reducing transaction costs since the pool would be the only entity with which to agree even on multiple licenses; then the pool is a useful tool to resolve legal disputes concerning patents.

---

[73] Josh Lerner, Marcin Strojwas, and Jean Tirole, "*The Structure and Performance of Patent Pools: Empirical Evidence*", January 11, 2003 : In their analysis highlighted five findings consistent with the theoretical predictions: "*First, pools involving substitute patents are unlikely to allow pool members to license patents individually, consistent with our earlier theoretical work. Second, individual licensing is more frequently allowed when the number of members in the pool grows, which may reflect the increasing challenges that reconciling users' differing technological agendas pose in large pools. Third, larger pools are more likely to have centralized control of litigation. This may reflect either the fact that the incentives for individual enforcement in large pools are smaller (i.e., because free riding is more intense) or the fact that large pools are more likely to include small players with limited enforcement capabilities. Fourth, third party licensing is more common in larger pools, consistent with suggestions that such pools were established primarily to resolve the bargaining difficulties posed by overlapping patent holdings. Finally, during the most recent era, when an intense awareness of antitrust concerns precluded many competition-harming patent pools, (a) more important patents were selected for pools and (b) patents selected for pools were subsequently more intensively referenced by others.* "

1. **The prompt development of technology**[74]**:** Patent disputes can block the development of new technologies; in this specific case the pool could facilitate the resolution of these disputes. The formation of the MPEG pool, created in order to achieve fast standardization of a protocol for protecting copyrighted works on the Internet, is one of the main recent examples of how pools could enhance technology developments. For example another area in which pools play a main role is the one of telecommunication where the development of new technologies is constant and quick. The members of the pool could share their developments to improve their work, and indeed the total welfare.

---

[74] According to Vianney Dequiedt, Bruno Versaevel in their paper *"Patent pools and the Dynamic Incentives to R&D",* January 2007 asses that "*the perspective of a pool enhances the speed of R&D "*

2. **Reduction of transaction fee**[75]**:** The company that would like to use a particular technology to improve its work could avoid negotiating with every patent holder that is essential to the standard. Considering another time the MPEG pool, there were at least fourteen different companies owing essential patents in that pool, and in order to use this technology a company should negotiate singly with each of these fourteen patent holders. Through the formation of the pool, the transaction cost can be cut down, and certainly the licensing of and the cooperation in valuable technologies can be facilitated.

---

[75] *"Thus, pools are expected to reduce transaction costs by creating "one-stop-shopping" opportunities for licensees and reduce license fees by eliminating royalty stacking, which occurs when firms charge inefficiently high prices for subsets of patents that cover complementary technologies."* Ryan Lampe & Petra Moser, "Patent Pools: Licensing Strategies in the Absence of Regulation", March 2012, Stanford University and NBER

3. **The authorization of blocking patents**[76]**:** Blocking patents can affect the improvement of technology by giving rival patentees the right to exclude each other from manufacturing, exploiting or selling the technology. Because of this, many important technologies cannot be used until some kind of agreement is signed. So one of the main task of the pool and even of the cross licensing agreements is to fix this problem by permitting Intellectual Property Rights to be "pooled" and "licensed" together.
4. **The reduction of litigation costs:** Patent litigations are extremely costly and ambiguous: one of the recent and biggest one is the case of *Apple Inc. against Samsung Electronics Co.* in which *after deliberating for*

---

[76] *"Cross-licensing and pooling arrangements . . . may provide procompetitive benefits by integrating complementary technologies, reducing transaction costs, clearing blocking positions, and avoiding costly infringement litigation. By promoting the dissemination of technology, cross-licensing and pooling arrangements are often procompetitive"* Robert P. Merges "Institutions for Intellectual Property Transactions: The Case of Patent Pools" , August 1999, University of California at Berkeley (Boalt Hall) School of Law Working Paper,

21 hours, 37 minutes, the jury in the Apple v. Samsung trial awarded Apple $1.05 billion in damages after Samsung was found to have wilfully infringed five of seven Apple patents.[77] Patent litigation puts patents in danger because judges, that are often not able to handle complex technical disputes, might invalidate them, cancelling the possibility to have an improvement in an old technology.

Then rather than risk and lose time and money companies chose to form a pool of patents in order to avoid litigation costs and above all to eliminate the possibility that their patents might be invalidate by the Court.

Moreover we should not forget that another pro competitive effect is patents pools encourage innovation by creating an instrument for the members to share the risks and the

[77] See http://www.wsj.com/articles/SB10000872396390444358404577609810658082898

benefits of new technologies. Moreover through the royalties paid by the companies interested in that particular technology, each patent holder will recuperate the investments made to develop its technology.
Through this mechanism the small firms could survive in the market covering their investments in R&D, be rewarded for their commitment and clearly avoiding the litigation costs against major firms.

Daen Uijl, Bekkers e De Vries have displayed the main characteristics of the modern patent pools[78]:

1. All the pooled patents are available for all the companies that join this kind of agreement, both as licensor and external licensees.

[78] Simon Den Ujil, Rudi Bekkers, Henk J.DE Vries "Managing Intellectual Property Using Patent Pool: lessons from three generations of pools in the Optical Disco Industry", 2013, California mangement review vol55N°4.

2. Licensees are offered standard licensing terms, usually a simple, coherent menu of "patent packages" with prices and other terms.
3. Licensing fees are allocated to each member according to a pre-set formula or procedure;
4. An independent party is involved to evaluate the essentiality of patents before they are included in the pool;
5. Membership for licensor is voluntary, and must allow additional patent owner to join after formation of the pool;
6. They include various adjustment mechanisms for adding new patents and recalibrating royalty shares.

Moreover Lerner, Strojwas and Tirole have added two more characteristics[79]:

[79] Lerner Josh, Marcin Strojwas, and Jean Tirole. "The Design of Patent Pools: The Determinants of Licensing Rules." *RAND Journal of Economics* 38, no. 3 (fall 2007).

7. It must be specified if the independent licensing is allowed to the patent holder
8. Some grant backs could be introduced into the licensing agreements.

4.2 Competitive concerns

As for the negative aspects: in the case of future patent sharing, pooling reduces the possibility that members invest more in R&D; price increase of product produced, with the possibility of dominance or monopoly in the market, falling incomes and deterioration of competition.

1. **Alteration of competition:** Through the process of patent pooling, horizontal competitors could join together; this led to a monopolistic situation in terms of prices on an otherwise competitive situation. The companies that join these agreements can raise and fix prices of the new technologies owned by them, a famous example is the one relative to the Case of Summit against VISX regarding the laser eye surgery techniques. In that case "*the pool established a $250 licensing fee to be paid to the pool each time a laser*

produced by either firm was used to perform photorefractive keratectomy".[80]

Moreover the exclusion from a patent pool will not generate an anti-competitive effect unless the excluded companies cannot compete in the relevant market and the pool members collectively have a dominant position on the relevant market.

Only in this last case the authorities will define the agreement as anticompetitive for the development of the pooled technologies.

2. **Effects on Innovation:** According to the last scientific researches, these agreements can have a disheartening effect on innovation.

   The patent system might encourage innovation limiting the patent holders monopoly on their new innovations.

[80] See Robert S. Schlosseberg, *Mergers and Acquisitions: understanding the Antitrust Issues*, third edition, 2008

These agreements contain a grant back clause, which forces all parties to make accessible to the pool any essential patent that they might get in the future. The grant back clause should have a pro competitive effect on competition, because it reduces the ability of any party to take advantage from the pool and then prevent other companies from sticking to the standards by blocking access to new essential patents. Due to the fact that a pooling agreement encloses all the essential patients necessary to attain specific standards could reduce a company's desire to invest in R&D.

3. **Protection of Invalid patents**[81]**:** The creation of a patent pool could protect invalid patent from

---

[81] *"The risk that a patent will be declared invalid is substantial. Roughly half of all litigated patents are found to be invalid, including some of great commercial significance."* Mark A. Lemley and Carl Shapiro, *"Probabilistic Patent"* Journal of Economic Perspectives, Volume 19, Number 2, Spring 2005, Pages 75–98

litigation, indeed many patent holders join a pool to avoid that litigation costs invalidate their patent.

A similar example was the one in the case of United States versus Singer Mfg. Co., in fact the pool formed by the Sewing manufactures was created in order to avoid that their patents might have been invalidated.

Moreover once invalid patents are pooled with rival companies the risk of a patent competition is eliminated, leading even in this case to the alteration of competition.

4. **Patent Troll[82]:** Patent troll is probably one of the worse scenarios of patent pool.

   A patent troll is an individual or an organization that purchases and holds patents for dishonest purposes such as stifling competition or launching patent

[82] "*A troll patent is one that:*
- *Is owned by someone that does not practice the invention.*
- *Is infringed by, and asserted against, non-copiers exclusively or almost exclusively. By copying I mean any kind of derivation, not just slavish replication.*
- *Has no licensees practicing the particular patented invention except for defendants in (2) who took licenses as settlement.*
- *Is asserted against a large industry that is, based on (2), composed of non-copiers.*" TJ Chiang (Professor at George Mason Law School), " *What is a troll patent and why are they bad?*" March 6, 2009

infringement suits. In legal terms, a patent troll is a type of non-practicing entity: someone who holds a patent but is not involved in the project or production of any product or process associated with that patent. Patent trolls are organizations that exist solely to obtain patents and profit from them through patent infringement claims.

Patent trolls usually acquire patents from a number of sources and collect them in large quantity. Most patents come from the sales of bankrupt companies, from companies who do not intend to exploit a technology and from individuals without the resources to improve their inventions. The patent system is very weak and patents may not be protected in acceptable terms.

For example Apple Inc. have had to pay £532.9 million to Smartflash LLC for wilful infringement of three U.S. patents. It seems a normal infringement case, but in reality Smartflash is a company that do

no make products, has no employees, creates no jobs, the only thing it does is to buy and own patents and wait that other companies infringe them in order to gain from the claims.

5. The economic effects of patent pools

The economic implication of the patent pools determines if the pool is pro competitive or anti competitive, for this reason it is very important for the antitrust analysis.

There are several economic advantages for companies that are part of the pool. First of all, as we said before, being part of a pool means have the immunity from patent infringement lawsuit for a violation of another member's patent. The second important advantage is that, through the pool, legal conflicts could be largely reduced, therefore decreasing the costs of litigation.

The pool creates a unit able to allow a large number of licenses to all the members inside the group, cutting down the main costs.

Moreover these kinds of agreements stimulate competition between producers who are licensed to market a product, which results in enhanced products and inferior prices for the customers.

Pooling help to increase the value of the patent so the royalties to be paid to its owner, and at the same time it could encourage R&D on the essential patent.
Furthermore the threat of a strategic behaviour is reduced, due to the fact that each pool has to hire an expert in order to evaluate if the patents are essential to the standard.

On the other side there are negative effects too. Indeed if a patent holder could access to valuable information about a licensee through its grant of immunity from an infringement suit, it will have a significant advantage over its competitors, damaging its competitors and the market.
Another negative effect is created by the pooling of future patents, discouraging competitors on investments in new technologies, and at the same time encouraging them to gain benefits from the time and the expenses spent by other members of the pool.

Finally the members of a pool could settle some limitations on patents, by increasing prices, by decreasing outputs and by distorting competition.

5.2 Model: players, strategies, payoff

This is probably the most complex chapter and before go ahead in analyzing the model, I want to introduce the most recent theoretical examples.

Theoretical models of patent pools have been discussed in a few recent papers. First of all, Gilbert and Shapiro provide simple models of competition with perfect substitutes and perfect complements, highlighting the double-marginalization problem (a case in which firms with market power sell complementary products, under this circumstance their prices are the highest one). Later, Lerner and Tirole exploit a model in which there is a world with n° of equal patents, which need not to be perfect substitutes or not to be perfect complements[83]. They demonstrate that a pool holding all the patents, which are complementary,

[83] J. Lerner and J. Tirole. Efficient patent pools. American Economic Review, 94(3):691–711, June 2004.

could be considered welfare increasing; and that forcing pool members to offer their own patents too, undermines the worst pools without affecting the best ones.

Brenner outspreads the Lerner and Tirole model, in order to study smaller, and so uncompleted, pools comprehending only some of the patents. According to Brenner some patent holders might remain outside of the pool in order to improve their performance, and observes which pools will be created under dissimilar formation processes.[84] Brenner compares the result attained under a particular formation procedure to the one obtained without a pool, and *"shows that mandatory individual licensing is not an efficient screening mechanism for welfare-decreasing pools"*.[85] Aoki and Nagaoka use a coalition formation model to show that even if there are all essential patents and the pool is the best solution it will not be created when the number of patents is

[84] See Vianney Dequiedt, Bruno Versaevel ,*"Patent pools and the Dynamic Incentives to R&D",* January 2007

[85] See Young-Kwan Kwon, Yeonabae Kim, Tai-Yoo Kim, Yongil Song, "Effects of Patent Pools on Innovation Investement- Ex Ante Perspectivves", Jornal of Business & Economics Research, July 2008

too large[86]. Subsequent Kim exhibits that through the formation of a patent pool, the presence of firms, owing patent, in the downstream market with vertical integration decreases the price of the final product[87].

Finally, Dequiedt and Versaevel highlight how the pool formation increases firms' R&D investments, before that the pool is created.

In all of these models, patents are assumed to be substitutable and this is their limitation: users gain value based on the number of patents they license, not based on which type. This means that either all or none of the patents are essential. Under this assumption, it seems that as long as the patents are complements, pools are generally appropriate.

---

[86] Aoki, Reiko; Nagaoka, Sadao, "*The Consortium Standard and Patent Pools*, May 2004, Hitotsubashi University Repository

[87] Young-Kwan Kwon, Yeonbae Kim , Tai-Yoo Kim , Yongil Song , "*Effects Of Patent Pools On Innovation Investment – Ex Ante Perspectives",* Journal of Business & Economics Research, July 2008, Volume 6, Number 7

Perhaps, the model that has tried to solve the limitations of the previous is the one of Daniel Quint.

This is a static model of price competition among patent owners, who license their patents to manufacturers.

This kind of model is very intuitive, and it discusses what conditions make a specific pool profitable in terms of prices and welfare.

According to Quint, the players are the patent-holders, and they form the set T= (1, 2, 3,….., T), the strategy series are the fees each patent owner charges in order to grant license, $p_i \in A_i = R^+$, Instead the payoffs are the licensing revenues, $u_i = p_i q_i (p_i, p_{-i})$, the model assumes that patent-holders fix prices simultaneously, and that each patent is individually owned or that multiple patents (hold by the same owner)are licensed together.

Then according to the model the different technologies, blocked by one or more patents, shape the set

K=(1, 2, 3,.., K). In this case the technologies are substitutes for each other, and the only alternatives are into the set K.

Finally the last variable introduced by the model is the measure of producers' $l \in L$, which shows the producer's profit from access to these technologies. The producers are heterogeneous; if producer $l \in L$ gains access to technology $k \in K$ his profit will be: $v_k + \in {}^{l}_{K} - P_k$, where v_k reflects the value of the technology, $\in {}^{l}_{K}$ is a particular term that refers to the producer/technology pair, and the P_k is the total cost to license the patent.

Producers access to no more than one technology, and their payoff from not accessing to any of the technologies is $\in {}^{l}_{0}$.

Even in this model a distinction between patents has to be made, the essential patents, which block all the technologies, and non-essential one, which could block only one of the

technologies. T^E defines the set of the essential patents; instead the one of non-essential patents is defined by $T^N{}_K$.

The demand for a given technology, considering all variables is:

$$v_k + \epsilon_k^l - \sum_{i \in T^E \cup T_k^N} p_i = \max \left\{ \epsilon_0^l, \max_{k' \in \mathcal{K}} \left\{ v_{k'} + \epsilon_{k'}^l - \sum_{i \in T^E \cup T_{k'}^N} p_i \right\} \right\}$$

There are two explanations of the model.

In the first one technologies are considered as different manufacturing techniques, and producers are separated by technique they prefer. Fees for licenses patents are paid as lump sums, and producers do not compete with each other. Since consumers are not taken in consideration by the model, producers are seen as the “end users” of each technology.

A second interpretation is based on consumers, not producers. Between patent owners and consumers, there is

a level of perfectly competitive producers with no fixed costs and identical marginal costs for products made with each technology. Patent holder prices derive form the per-unit licensing fees, producers earn zero profits and their surplus increases to the increase of consumers. The analysis remains substantially unchanged, excluding that the mean value of each technology is net of the producers' marginal cost. Under this analysis, it appears more ordinary to see the technologies as different products, or as different bundles of components. Thus, in this case, the bundling of consumer goods, or the pricing of aggregate products made up of components supplied by different firms could be studied by the model.

In the end, the variables noted to the model are:

• The number of technologies K = |K|

• The distribution F from which the idiosyncratic terms ε^{l}_{0} and ε^{l}_{k} are drawn

- The mean value of each technology, (v_1, v2, ..., v_K), which will be abbreviated in v

- The number of essential patents, $n_E \equiv |T^E|$, and the number of nonessential patents blocking each technology k, $n_k \equiv |T^N{}_k|$, abbreviated in $n \equiv (n_E, n1, n2, ..., n_K)$ the author will refer to "aggregate prices" as the sums of prices demanded by each set of similar patent holders:

- $P^N{}_k \equiv \Sigma\, i \in T^k{}_N\, p_i$ is the combined price of all the nonessential patents blocking technology k
- $P^E \equiv \Sigma i \in T^E\, p_i$ is the combined price of all the essential patents
- $P_k \equiv P^E + P^N{}_k$ is the total price to access technology k

Then the author made the following assumption about the distribution of idiosyncratic terms $\varepsilon^l{}_k$:

"Assumption 1: $\varepsilon^l{}_0$ and $\varepsilon^l{}_k$ are independent and identical distributed random variables across producers and technologies. The distribution F from which they are drawn is

strictly increasing on (−∞, ∞), and F and (1 – F) are log concave.

This condition is sufficient to begin to understand the equilibrium prices demanded by patent holders.

Lemma 1. Fix a game G = (|K|,F,v,n).

- *An equilibrium exists and is unique*
- *The equilibrium value of P^E is increasing in n_E and decreasing in (n_1, n_2,...,n_K)*
- *The equilibrium value of $P^N{}_k$ is decreasing in n_E and increasing in (n_1,n_2,...,n_K)*
- *The total price P_k of technology k is increasing in n_E and in n_k (but $P_{k'}$ ($k' \neq k$) may be increasing or decreasing in n_k)*

The pricing game among patent holders is not a super modular game, due to strategic substitutability between players in the same grouping (T^E or $T^N{}_k$); but equilibrium can be shown to be symmetric among players within each

grouping, and each set of players can therefore be replaced by an "aggregate" player who mimics their combined actions. The resulting K + 1-player game is a super modular game when log-payoffs are considered and the sign of the "essential" player's price is reversed, and is indexed by $(-n_E, n_1, n_2, \ldots, n_K)$*; the results follow.*

To make sharp welfare predictions, we will require one additional regularity condition on the demand for each technology. Since the "aggregate players" do not maximize profits, it is possible for a "positive" change – an increase in the price of a rival technology – to lead to a sufficiently strong overreaction in the price of another technology that patent holders blocking that technology are left worse off. We impose a condition, which will rule out this sort of perverse result.

Assumption 2. The log of the inverse demand function $P_k(q,\cdot)$ *has increasing differences in q and* $P^N{}_{k'}$ $(k \neq k)$*, and in q and* $-P^E$*; and* $\log P^E(q,\cdot)$ *has increasing differences in q and* $-P^N{}_k$*.*

Assumption 1 implies increasing differences in the log-demand

functions – an increase in one price raises the demand for a competing technology, but also lowers the price-elasticity of demand for that technology. This implies that an oligopolistic pricing a single technology would respond to an increase in a rival technology's price by raising his own price. Assumption 2 implies that the increase would be small enough to maintain a higher market share than before. The condition holds for logit demand;

Under Assumptions 1 and 2, we can make precise predictions about the impact of n on equilibrium payoffs. Let u_k *denote the equilibrium profit of each patent holder in* $T^N{}_k$*, and* u_E *the equilibrium profit of each patent holder in* T^E*:*

Theorem 1. Under Assumptions 1 and 2,

1. $(u_E, u_1, u_2, \ldots, u_K)$ *are all decreasing in* n_E
2. u_E *and* u_k *are decreasing in* n_k*; for* $k' \neq k$, $u_{k'}$ *is increasing in* n_k *"*[88]

[88] See Daniel Quint *"Economics of Patent Pools when some (but not all) Patents are Essential"*, , Stanford Institute for economic policy reasearch, November 2006

The general results of this model are:

A pool containing only essential patents will:

- Lower the price of each technology
- Increase the surplus of each individual producer
- Increase the profits of every patent holder outside of the pool

In case the pool is profitable for its members, it is a Pareto-efficient.

Instead considering a pool of nonessential patents which block a single technology k, or the addition of these patents to an existing pool of essential patents. The effects will be:

- A decrease in the price P_k of technology k

- An increase in the profits of the essential patent holders, and in the profits of nonessential patent holders who block technology k but remain outside the

pool

- A decrease in the profits of nonessential patent holders blocking the other technologies The total prices of the other technologies $P_{k'}$ may increase or decrease, and the net effect on welfare may be positive or negative.

5.3. The effect of prices on total welfare in different patents

Even in this case, thanks to the model, we can find out which is the real effect of the patent pools, in terms of prices, on the total welfare.

The model identifies the welfare as the sum of all patent holder and producers' payoff. The payments made to the owner of the patents by the producers are considered welfare-neutral, since according to the model the only source of value is the gross profits of each producer.

Therefore producers who could gain profits from the utilization of some technology, but that could not be able to afford the licensing fee and so remain out of the market, and producers who have invested in the wrong technology are the only two causes of inefficiency into the model.

A reduction in the combined price of all non-essential

patents reduces the prices of all technologies by the same amount, but at the same time the choice of the technology made by the producers does not change. The other effect is that there will be more producers in the market and therefore there will be created more value. So the total welfare is decreasing.

On the other side, taking in consideration a decreasing in the combined price of non-essential patents blocking only a technology K will reduce only the price of technology K.

In this case the effect of a price reduction will encourage some producers to switch to technology K, creating value in that market, and to abandon other technologies. Moreover the producers, switching to the technology K, will reduce the total welfare, and if the different in prices is very accentuated, this effect will be larger. Therefore the prevailing effect of a pool of non-essential patents blocking a single technology is to shrink the price of that specific technology. This effect could lead to a positive or negative

welfare result, subject to if that technology is relatively expensive or cheap.

The last case is the one of patent pool created by essential patents. The effect of a pool made by essential patents is to lower the prices of all technologies, increasing the total welfare.

5.4. The evolution towards the pool of pools

Patents pools can be classified according to their complexity. There are three particular forms based on this characteristics, which describe the evolution process that pools can have:

- Joint Licensing Program
- Regular patent pools
- Pool of pools

The three typologies have been identified and studied by Den Uijl, Bekkers and De Vries, which highlighted the factors that have determined evolution of patent pools.

These factors are: the number of parts involved in the development and creation of the technology and the complexity of the technological platforms.[89]

[89] See Den Uijl S., Bekkers R., De Vries H.J., "Managing Intellectual Property Using Patent Pools: lessons from three generations of pools in the optical disc industry", 2013 California Management Review.

In order to develop a technology, avoiding fragmentation, it will require the collective participation of different patent holder; according to the authors, as the number of co-creators increases, the complexity linked to the developments increases too and so there is the need for a more evolved form of pool. In addition, technology platforms shared are used in order to improve a cooperative development, and encourage it. These platforms can in turn be more complex and require more coordination effort, therefore, is required their implementation to face a grater complication.

The first form, Joint Licensing Program, represents the less complex one, involving a small number of co-creators.

It uses simple technology platforms; an amount of restricted parts will agree to combine their patents and fire them to a predetermined price; therefore it will not be allowed to pool new licensor.

In the Joint Licensing Program, the parties are involved in

co-creating a relatively simple technology. Given this simplicity, the Joint Licensing Program involves minimal costs, but they require coordination skills and often are administrated by part with more experience in licensing.

Finally the Joint Licensing Program, given the low involvement of different parts, their low numerosity, their simplicity of operation and coordination, will be very quick to form.

The Regular Patent Pools are the most common form of patent pools, involving a large number of parts.

Generally they hold a single technology, but that one will be more complex than the one in a joint licensing program. The higher technological complexity increases the complexity of the platform used for these one.

For this reason the Regular Patents Pools are positioned in the middle between the Joint Licensing Program and the Pool of Pools; the costs will be higher ad the time required

for their established will be higher too.

Finally we found the last form; the Pool of Pools, the most modern, which results mainly from the evolution of technology. The complexity in the formation and management are extreme, given the large number of members and the equally complex technologies that are managed. The time needed to create such an entity can be multi year and involve elevated costs.

The most important difference compared to other forms is that the pool of pools manages multiple technologies and then incorporated patents of different nature. In the pool of pools the patents will not be complementary to each other, but the technologies will be.

Once this organization is created, it will have very important prospective in the market and it will bring great benefits in terms of Intellectual Property Rights. The large number of patents managed allows a greater flow of knowledge to spread and be used. The technologies will be adopted and

the economies of experience will be achieved in a short time, stating a general standard made up by several standard technology components.

5.5. Difficulties during the formation of the pool

The formation of the pool includes great benefits in terms of exploitation of knowledge, one of these contributions is to reduce the complexity resulting from the fragmentation, but at the same time, its setting up involves other forms of complexity that it must face[90].

These obstacles are:

a) **Negotiation costs**: In order to form a patent pool it is necessary for the members to agree on many aspects of its operation, involving many legal costs. The benefits of the patent pool will, therefore, be compared whit such costs.

   The main costs are the Royalty fees and the fixed costs[91].

---

[90] See Den Uijl S., Bekkers R., De Vries H.J., "Managing Intellectual Property Using Patent Pools: lessons from three generations of pools in the optical disc industry", 2013 California Management Review.

[91] See Santore R., McKee M., Bjornstad D., "*Patent pools as a solution to efficient licensing of complementary patents? Some experimental evidence*", 2010,Journal of Law and Economics

The former is a variable pricing depending on the quantity used of knowledge. This means that with the increasing production scale will increase the cost associated to the licensee, a possible consequence will be to discourage the downstream, that in order to avoid the excessive cost of production, will reduce the volumes, triggering a serious loss of social welfare. The latter is a fixed imposition, defined in advance. It has the effect of not impact over the marginal costs and therefore not to determine the inefficiencies related to costs for the downstream. The price given does not vary according to the production carried out by the licensee, and this allows for more flexibility without changing the production volumes. But on the contrary these fees can still determine a value too high for producers and thus discourage the downstream that will not purchase more rights of exploitation of a given knowledge. The second inefficiency occurs when the

patent holder, finding it hard to coordinate on these fees, may not invest any more resources in innovation.

b) **Asymmetric information**: This type of barrier can lead to failure of the formation. For example, it could be possible that different expectations about the value of patents between the members are influenced by more or less completed information.
"Information asymmetry is likely to be reduced when more information is publicly available". [92]

c) **Self-imposed constraints**: A negotiation requires flexibility by the participants in order to find the correct balance between their bargaining power and their needs. This compromise will determine the operating conditions of the patent pool, such as the

[92] Farrell J. *"Intellectual property as a bargaining environment"*, 2009, National Bureau of Economic Research

allocation of royalties and fees from members, who may be indistinct or may vary according to the contribution of each member to the pool.

6. Recent cases (4G-LTE)

In the last section of this paper I am going to study the patent pools in the telecommunications segment and in the related technological industries.

The development in the telecommunications industries and in the technological industries is highly related with the creation of the patent pools.

Therefore the growth of consumer electronics, telecommunications, computers, and associated high-tech industries is sharp by innumerable technologies.

Increasingly, these technologies implicate several blocking patents owned by multiple patent holders. A recent case is the competition among three outsized smartphone operating systems: IOS, Android, and Windows Mobile.

In these kind of industries there is a highly correlation between who develops the new technology and who implements it in order to generate profits, and design new products.

For example, in the telecommunications industry, each phone manufacturer has owned only a small fraction of the different types of intellectual property assets needed to develop a 3G well-matched cellular phone.

In the telecommunications sector, the first case of patenting is the one relative to the GSM standard for the mobile communications in Europe, in the early 1980s.[93]

The GSM technology had two specific characteristics: the switch from an analog technology to a digital one, and the interlining of different national networks.

In 1988, the main European operators created a system by which manufacturers would have to hand over their intellectual property rights and to provide free world wide licenses for essential patents.

Obviously the manufacturers do not agree, and in order to establish a right condition, the operators modify their approach. Finally, the operators required the suppliers to

[93] See http://www.gsma.com/aboutus/history

sign a declaration agreeing to serve all of the GSM community on fair, reasonable and non-discriminatory conditions.

During the 1990s Motorola, one of largest IPR holder, refused to grant non-discriminatory licenses for its substantial portfolio of essential patents. Subsequently, Motorola agreed to these terms under limited conditions, and achieved only a minority of supply contracts. At the same time, it refused to license its IPR under royalty, but instead required cross-licensing, eventually negotiating licenses with Siemens, Alcatel, Nokia and Ericsson.

Companies were only willing to diminish their licensing conditions when their revenue opportunities increased.

Indeed "*these cross-licensing agreements provided a strong cost advantage for these five major patent holders, and created high barriers to entry by prospective GSM suppliers,*

with royalty rates for non-cross-licensees estimated at 10-13% ".[94]

Next, in July 2000 3G Patent platform was created; it was made by 18 partners.

"3G telecommunication networks support services that provide an information transfer rate of at least 200 kbit/s. Later 3G releases often denoted 3.5G and 3.75G, also provide mobile broadband access of several Mbit/s to smartphones and mobile modems in laptop computers. This ensures it can be applied to wireless voice telephony, mobile Internet access, fixed wireless Internet access, video calls and mobile TV technologies."[95]

The purpose behind this platform was to offer a voluntary and cost effective mechanism to assess, prove and license patents that were essential for third generation mobile communication systems. According to the deal, the platform

[94] See Rudi Bekkers, Joel West, "*The limits to IPR Standardization Policies as Evidenced by Strategic Patenting in UMTS*", Paper forthcoming in Telecommunications Policy February/March issue 2009
[95] See http://en.wikipedia.org/wiki/3G

would have pro competitive effects like the simplification of access to technology and resulting entry into the markets, the reduction of cost uncertainties and the reduction of delays that were accompaniments of licensing several essential patents for complicated technologies.

The 3G pool was a simple facilitator of transactions between patent holders and licensees, in which membership was open to both licensors and licensees. This agreement is different from the other pooling agreement.

For example, in this pool, licensing by members is not restricted to the Platform. In this kind of patent pool, in contrast with the standard one, there is no only one license between the patent holders (as a combination of firm) and the licensee. Additionally the parties have the chance to choose between the Standard License of the Platform and a negotiable individual license. Moreover this kind of platform requires a price cap, which is not absolute and settled at a pre-determined royalty rate, but is default 5% maximum

cumulative royalty rate for potential licensees per product categories. According to the patent portfolio under each product type chosen by the licensee, the royalty rate, for each singular patent, will be different for each of the licensees.

During the choice of the action to undertake for the UMTS, the worries, the fears and the challenges of the GSM experience were useful observed.

European actors mainly were suspicious of Qualcomm. They were waiting that the firm could demand high license fees, and that those fees could be much more than 10% higher. The W-CDMA Patent Licensing Programme for UMTS FDD Patents was settled during the 2004, after many attempts for developing licensing schemes failed.

At the beginning, seven licensors offered their patents as a bundle to forthcoming licensors, a number that diminished over time.

After the 3G, the new step in the innovation technology telecommunication was the development of Long Term Evolution (LTE), which was essential to the creation of the 4G technology.

LTE patents are being viewed as among the most valuable intellectual property resource in the mobile telecommunications industry, with most operators around the world building LTE networks.

According to a statistic conducted in 2011, the L.G. Electronics owned 23% of the patents of this technology; the second biggest owner was the Qualcomm with 21%. Then, the 9% of the patents was owned by Motorola, Mobility, InterDigital, Nokia and Samsung. China's ZTE owned 6% and Nortel owned 4%, which were later sold, because in 2009 Nortel failed, to a consortium of Apple, EMC, Ericsson, Microsoft, Research in Motion (RIM) and Sony. Ericsson also individually held 2% of the patent pool and RIM owned the last 1%.

Other analysis, made during the 2011, gave different results, because each company holding the patents willing to depict itself as the market leader.

The LTE environment is very complex to analyze, indeed one of the main problems was relative to the determination of which patents are essential and which are not essential. And the relative problem of the disputes there were hardly to evaluate. Furthermore, the value of these patents changes depending on the existence or the absence of definite conditions, such as transfer restrictions, cross licensing arrangements, ownership and market conditions.

For all these reasons there was the need to have a patent pools in this field, finally realized in 2009-2010. At the beginning, the patents owners disagree to form the pool, even because the W-CDMA (Wideband Code Division Multiple Access) was not so successful. All the players assumed that could gain more monetary cross licensing and litigation defense value if they did not pool their patents.

During 2009, there was the formation of the LTE, after that the Next Generation Mobile Network Alliance (NGMN) demand for information about the foundation of the pool to company like Via Licensing, Sisvel and MPEG LA. Sisvel's suggestion wanted to show that patent pools could avoid excessive costs from royalty stacking. Among various other examples, Roberto Dini, the founder of Sisvel suggested that patents could be licensed individually, at $2.50 cents each piece. In 2011, the Next Generation Mobile Network Alliance agreed strongly with the formation of the pool, and for this reason decided to advice all stakeholders in the mobile industry in order to accelerate in the process for the formation of the LTE pool. The Next Generation Mobile Network thought that the patent pool could promote rational royalties, offer certainty on the accessibility of the licenses for patents and be more appropriate in order to evaluate the patents' essentiality, because established by the industry.

The Via Licensing Patent Pool emerged in late 2012, where licenses were offered under a portfolio of patents essential to LTE. The pool includes patents owned by AT&T, Hewlett-Packard KDDI, NTT Docomo, SK Telecom, Telecom Italia, Telefònica and ZTE. Then in the late 2013 China Mobile and Deutsche Telekom were joining the pool, the last one to be part of the pool was in 2015 Google. The pool is also open to other organizations that have patents essential to LTE. "*Via has been public about the pricing it is seeking for the pool. It charges between $2.10 and $3 per handset for the patent pool. The revenue is then split largely based on the number of patents held by each company in the pool*."[96]

The Sisvel pool, launched in 2012, also developed its own LTE Patent Pool, with the initial companies in this pool being Cassidian, the China Academy of Telecommunication Technology, the Electronics and Telecommunications Research Institute, France Telecom, TDF, and KPN, in

[96] See http://recode.net/2015/04/09/google-joins-stable-of-tech-companies-licensing-their-lte-patents-as-a-group/

addition to some patents that had been originally filed by Nokia but were acquired by Sisvel in 2011.

Like the one of Via Licensing, this pool is also open to other organizations that believe they hold essential LTE patents, and they are encouraged to submit the same for evaluation. Both in the Via and in the Sisvel pools there is the absence of the big players in the industry like Qualcomm, Nokia, Ericsson, Huawei Technologies and Samsung Electronics, the reason behind this choose is that the key patent holders may prefer private licensing and subsequent litigation over pooled resources in patent pools.

7. Conclusions

As we have seen from the discussion, the effects of the patent pools on the innovation and on the total welfare are very complex and contrasting.

The main point emerged by the paper, as Shapiro, Lerner and Tyrole that I have already said, is that "*if the patent are complementary in nature, patent pools can reduce the overall licensing royalties by internalizing pricing externalities and thus are pro-competitive. However, if they are substitute patents, patent pools can be used as a collusive mechanism that eliminates price competition, and thus are anticompetitive.*" [97]

But the discussion is much more complicated than that, the development effects on total welfare and innovations are hinted by other elements like the weakness or the strength of each patent. Indeed, according to these criteria, we could

[97] See Josh Lerner, Jean Tirole " Efficient Patent Pools", National Bureau of Economic Research", 2002

asses that the weight of the patents could particularly affect the development of its R&D.

Let us summarize the main insights that make result the patent pool as an instrument for innovation development and welfare enhancing:

- **The pro-competitive pools**: if the patents examined are complementary, the pool could have only one result: be welfare-enhancing.

Patent pools provide clearness, let the flow of information be simplified and allow the adoption of a technological standard.

The effect of a more fluid information flow, results in a decreasing impact on transaction costs in relation to the time and the effective costs in achieving what you require.

The patent pool could be considered an useful and applicable solution, if not the best, in an environment where

fragmentation arises as the main obstacle to the use of knowledge.

The mission of the pool is to gather a group of patents belonging to distinctive patent holder in order to facilitate their utilization in the market, in general, and for the manufacturer of the downstream, in particular.

Without this formation, fragmentation, which arises in the Intellectual property situation, consequently lead to a non-use of knowledge, therefore to the so-called Tragedy of Anti-commons.

Moreover, apart from the implementation of a proper use of knowledge, the development expectation due to the network externalities, existing in the technological sectors, and the economies of learning are improved by the patent pool.

For the users, the presence of network externalities means have a much grater number of adopters; consequently they might also profit from a lower price of products that

incorporate.

Certainly the implementation of new economies permit increasing the performance of technology and reducing production costs; Obviously in order to achieve this kind of levels, both the economies of scale and experience should reach a significant and substantial level of production.

Only if these conditions occur, it determines a reduction of costs for the consumers and an improvement of performance.

Therefore if the technology spreads in the market and the number of users increases, becoming huge, in presence of network externalities, economies of experience will be obtained. Obviously in absence of entities such as the Patent Pool, it will stand at the mercy of Anti-commons and a significant loss in terms of social welfare would be generated as a result of the under-utilization of knowledge.

The patent pool, encouraging the endorsement of

technology, allows the reaching of economies of learning more rapidly and additionally improves the innovative process of aggregate knowledge, over and above supplying to the downstream producers, who are always hunting for distinctive applications, directing resources towards research and development.

Clearly, due to the innovation process that becomes faster, the supplementary technology cycles will be reduced, and there will be more probable the manifestation of discontinuity.

This mechanism creates negative effects for players operating in these areas, but meanwhile results in positive effects for the community because it encourages the production of new knowledge.

In this standpoint, the intellectual property rights protection mechanism, permits the spillover from those who have contributed to this progress and growth and concurrently allows an improvement of social welfare for applications

resultant from upgraded knowledge.

The patent pools will carry benefits for both the community and its members.

The members will benefits from their aggregation, because there will be an increase in competitiveness that comes from the merger of knowledge belonging to the members, because of the achievement of economies of experience, because of the faster preserved technology diffusion, and because of the income resulting from it.

Social welfare will develop as a result of the increase in information obtainable on the market, the lower costs associated with the development of this knowledge, the grater diffusion of technology and the improved ability to generate aggregate knowledge.

The real side of the coin is that: Patent pools for technologies like DVD/MPEG technology, 2G/3G mobile telecommunications and XML reference drafts have proved to be a success in challenging the problems of patent thickets and transaction costs involved in them. But, patent pools do not remove all the complications. Patent pools may bring out some issues of anti-competitive effects. Generally, the increasing number of patents is not directly proportional with the increasing number in aggregate R&D levels, and this could be one of the main signal showing that patent portfolio strategies may not be welfare improving.

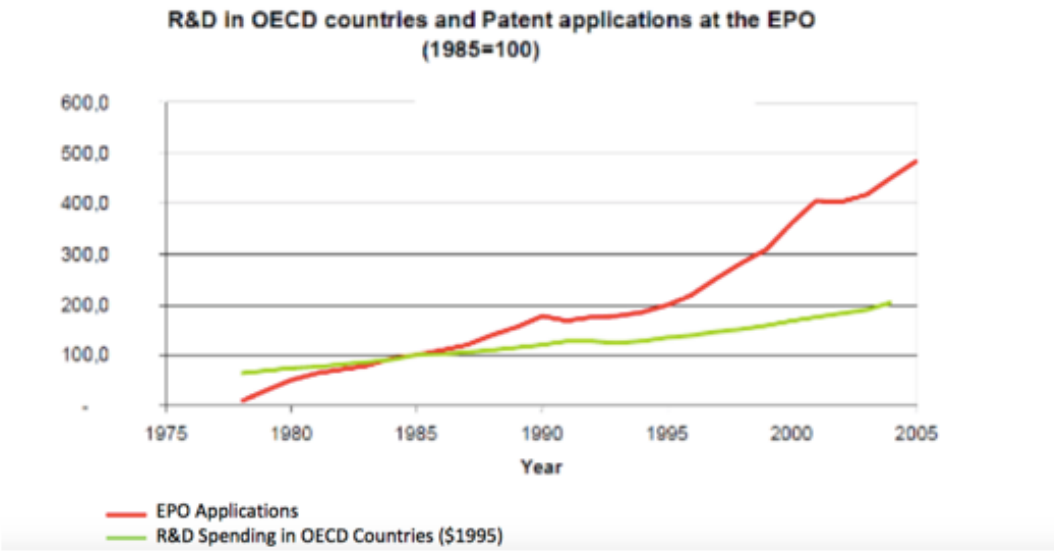

Chart 1.1. R&D in OECD Countries and Patent Applications at the EPO (1985=100), Source: Hall et al. (2007a) based on their calculation from EPO Annual reports (various years) and EPOLINE -Data provided by the EPO

According to a statistic made by Hall the patent applications at the EPO increased from 70,955 to 145,241, corresponding to an annual growth rate of 7.4%, whereas real expenditure on R&D increased from $398 to $555 billion, matching to an annual growth rate of only 3.4%.[98] Hashimoto and Haneda showed that there is decrease in the R&D efficiency/productivity rates; their research was made in the Japanese pharmaceutical industry between 1983 and 1992. According to their work in that field there was a 50% of efficiency loss even if firms continued to increase their R&D expenditure[99].

Additionally, the intensification in patent submissions is a consequence of portfolio battles and not of generally needed R&D as shown by the decline in renewal activity since the

[98] Hall, B.H., Harhoff, D., Hoisl, K. et al. "*The Strategic Use of Patents and Its Implications for Enterprise and Competition Policies*", Tender for No. ENTR/05/82, July, 2007,

[99] Hashimoto, A. and Haneda, S. " *Measuring the Change in R&D Efficiency of the Japanese Pharmaceutical Industry"*, 2008, Research Policy, vol. 37, 10, 1829-1836.

1990s across investments most categories of patent ownership and country of patent origin.[100]

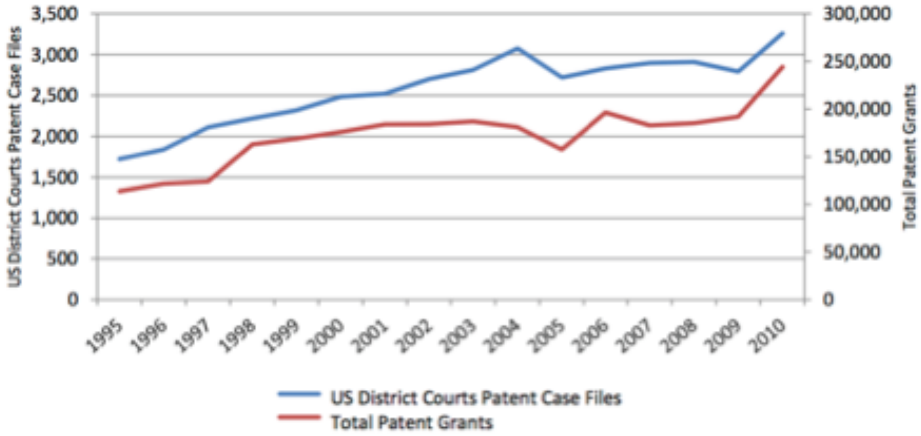

Chart 1.2. Patent Case Filing and Grants, Sources: USPTO: Performance & Accountability Report and US Courts: Judicial Facts & Figures include both US and private cases

Another substantial signal is that the proliferation of patent applications has been followed by intensification in patent litigation. For example, Chart above shows that between 1995 and 2010, the number of patents granted by the US Patent and Trademark Office (USPTO) has augmented meaningfully, from 113,834 to 244,341 patents, which matches to an annual compounding growth rate of 4.88%.

---

[100] Brown, W.H. [1995], Trends in Patent Renewals at the United States Patent and Trademark Office, in World Patent Information

And at the same time, even the total number of patent cases marched in the US District Courts has also amplified from 1,723 to 3,269 cases, corresponding to an annual compounding growth rate of 4.06%. Obviously patent litigation is highly costly, and for this reason it includes many indirect costs, which are socially wasteful. Bessen and Meurer during their study analyzing patent lawsuit filings discovery that the expected combined loss of litigating parties is possibly much bigger than the expected attorneys' fees due to indirect business costs. The main concern about these direct and indirect costs is that the risk of violation can negatively affect the R&D efforts of firms and hence act as a tax on innovation[101].

The conclusion derived from this part is that it is highly difficult to identify which patenting activities should be banned from a policy standpoint as these patenting

---

[101] Bessen, J. and Meurer, M.J. *" The Private Costs of Patent Litigation"*, February 1 2008, Boston University School of Law Working Paper No. 07-08.

strategies are also a part of firms' innovation evaluations, in fact the pooling of patents appears to have a positive impact on R&D activity and social welfare, but as highlighted by the real dates, the path of the pool is not foreseeable, because it is influenced by too much variables that are not easily identifiable.

Bibliography

Aoki, Reiko; Nagaoka, Sadao, "*The Consortium Standard and Patent Pools*, May 2004, Hitotsubashi University Repository

Aoki, M. Information, "Toward A Comparative Institutional Analysis",2001, Journal Of Economics & Management Strategy, vol. 12, 2, 151-178., The MIT Press.

Barton, J.H., "*Antitrust Treatment of Oligopolies with Mutually Blocking Patent Portfolios"*, 2002, Antitrust Law Journal, vol. 69, 3, 851-882.

Beard, T.R. and Kaserman, D.L. "*Patent Thickets, Cross-licensing, and Antitrust*" Antitrust Bullet, 2012 vol. 47, 2-3, 345-368.

Beeney, G. R. [2002], *"Pro-competitive Aspects of Intellectual Property Pools: A Proposal for Safe Harbor Provisions".*

Bekkers R., West J., "*The limits to IPR Standardization Policies as Evidenced by Strategic Patenting in UMTS*", Paper forthcoming in Telecommunications Policy February/March issue 2009

Bessen, J. , "*Patent Thickets: Strategic Patenting of Complex Technologies",* March 2003, Research on Innovation Working Paper,

Bessen, J. "*Holdup and Licensing of Cumulative Innovations with Private Information*", 2004 ECONOMICS LETTERS, vol. 82, 3, 321-326.

Bessen, J. and Meurer, M.J. ,*" Patent Litigation with Endogenous Disputes",* 2006 AMERICAN ECONOMIC REVIEW, vol. 96, 2, 77-81.

Bessen, J. and Hunt, R.M. ," *An Empirical Look at Software Patents"*, 2007,JOURNAL OF ECONOMICS & MANAGEMENT STRATEGY, vol. 16, 1, 157-189.

Bessen, J. and Meurer, M.J. , "*The Private Costs of Patent Litigation*", February 1 2008, 2008, Boston University School of Law Working Paper No. 07-08.

Bessen, J. and Meurer, M.J. , *"Patent Failure: How Judges, Bureaucrats, And Lawyers Put Innovators At Risk",* 2008*,* Princeton University Press.

Bessen, J. and Maskin, E. , *"Sequential Innovation, Patents, and Imitation",* Rand Journal Of Economics, vol. 40, 4, 611-635.

Brown, W.H. ,"*Trends in Patent Renewals at the United States Patent and Trademark Office"*, 1995, World Patent Information, vol. 17, 4, 225-234.

Chiang TJ , " *What is a troll patent and why are they bad?*" March 6, 2009

Chiao, B., Lerner, J. and Tirole, J.,"*The Rules of Standard-Setting Organizations: An Empirical Analysis*", 2007,Rand Journal Of Economics, vol. 38, 4, 905-930.

Cohen, M. W., Nelson, Richard R., Walsh, J.P. , "*Protecting their Intellectual Assets: Appropriability Conditions and Why U.S,. Manufacturing Firms patent (or Not)"* NBER Working Paper No. 7552, February 2000

Commission of the European Communities. [1983], Commission Regulation n°.2349/84/EEC of 23 July 1984 on the Application of Article 85(3) of the Treaty to Certain Categories of Patent Licensing Agreements, Official Journal of the European Communities, No. L 219/15 (1983), subsequently amended several times.

Commission of the European Communities. [1996], Commission Regulation n°.240/96/EEC of 31 January 1996 on the Application of Article 85(3) of the Treaty to Certain Categories of Patent Licensing Agreements, Official Journal of the European Communities, No. L 31/2 (1996).

Cunningham A. & John M. Payne, *"Planning And Control Of Land Development"* 131-32 (4th Ed. 1995)

Den Ujil S. , Bekkers R., DE Vries H.J., "*Managing Intellectual Property Using Patent Pool: lessons from three generations of pools in the Optical Disco Industry*", 2013, California mangement review vol55N°4.

Dequiedt V. and Bruno Versaevel B. *"Patent pools and the Dynamic Incentives to R&D",* January 2007

Eagle S.J. "*Regulatory Taking*",2005, Lexis/Nexis 5th ed

Ebersole T.J. , Guthrie M.C., and Goldstein A.J. "*Patent Pools as a Solution to the Licensing Problems of Diagnostic Genetics*", January 2005, Intellectual Property and Technology Law Journal.

European Commission. [2004], Commission Regulation (EC) n° 772/2004 of 27 April 2004 on the Application of Article 81 (3) of the Treaty to Categories of Technology Transfer Agreements, in OFFICIAL JOURNAL OF THE EUROPEAN UNION, 11-17.

European Commission. [2004], Commission notice 2004/C 101/02 Guidelines on the Application of Article 81 of the EC Treaty to Technology Transfer Agreements, in OFFICIAL JOURNAL OF THE EUROPEAN UNION, vol. 47, 27, 2-42.

European Commission: Communication from the Commission — Guidelines on the application of Article 101 of the Treaty on the Functioning of the European Union to technology transfer agreements

Farrell J., John Hayes, Carl Shapiro, Theresa Sullivan, "*Standard Setting, Patents, and Hold-Up*", Antitrust Law Journal Vol.74 No. 3 (2007). Copyright 2007 American Bar Association.

Farrell, J. and Shapiro, C. , "How Weak Are Strong Patents?", 2008, American Economic Review, vol. 98, 4, 1347-1369.

Farrell J. *"Intellectual property as a bargaining environment"*, 2009, National Bureau of Economic Research

Federal Trade Commission. [1999], In the matter of Summit Technology, Inc. and VISX, Inc. Docket No. 9286.

Gilbert, R.J. and Shapiro, C. , "*Optimal Patent Length and Breadth*",1990, Rand Journal Of Economics, vol. 21, 1, 106-112.

Gilbert J. , Shapiro C., Kaplow, L. and Gertner, R. "*Antitrust Issues in the licensing of Intellectual Property: The Nine No-No's Meet the Nineties*", 1997, Brookings papers on Econ. Activity, Microeconomics

Gilbert R.J. ,"*Antitrust for Patent Pools: A century of Policy Evolution*" 2004 Stanford Technology Law Rev. 3,1,

Graham S. and Mowrey D., "*Submarines in software? continuations in us software patenting in the 1980s and 1990s"*. Economics of Innovation and New Technology

Graham, S.J.H. and Harhoff, D., "*Can Post-Grant Reviews Improve Patent System Design?: A Twin Study Of Us And European Patents,"* ,2006, Centre for Economic Policy Research.

Greenleaf W., "*Monopoly on Wheels: Henry Ford and the Selden Automobile Patent"*, Detroit, Wayne State University Press, 1961, p. 243.

Grimpe C. And Hussinger K., "*Building And Blocking: The Two Faces Of Technology Acquisition*"; Discussion Paper N°08-042; March 2009

Hall, B.H., Harhoff, D., Hoisl, K. et al. *" The Strategic Use of Patents and Its Implications for Enterprise and Competition Policies",* Tender for No. ENTR/05/82, July, 2007,

Hall, B.H. and Ziedonis, R. , *"An Empirical Analysis of Patent Litigation in the Semiconductor Industry*", January 2007, University of California at Berkeley Working Paper,

Hardin G., "*The Tragedy of the Commons"*, 1968, *Science*, vol. 162, nº 3859, 1968

Hashimoto, A. and Haneda, S. " *Measuring the Change in R&D Efficiency of the Japanese Pharmaceutical Industry"*, 2008, Research Policy, vol. 37, 10, 1829-1836.

Heller M.A., "*The Tragedy of the Anticommons: Property in the Transition from Marx to Markets"*, 111 Harv. L. Rev. 621 (1998);

Heller M.A. and Eisenberg R.S., "*Can Patents Deter Innovation? The Anticommons in Biomedical Research"*, 280 Science 698 (1998).

Hunt, R.M., "*When Do More Patents Reduce R&D?"*, 2006, American Economic Review, vol. 96, 2, 87-91.

Jeitschko T.D. & Zhang N, "*Adverse Effects of Patent Pooling on Product Development and Commercialization* "April 2013, Dusseldorf institute for competition economics

Kennedy D. E., *"The Automobile Industry: The Coming of Age of Capitalism's Favorite Child"*, New York, Reynal & Hitchcock, 1941

Klein J.I., "*An Address to the American Intellectual Property Law Association*", 2 May 1997, the subject of cross licensing and antitrust law

Lampe R.L. and Moser P., *"Do the patent pools encourage innovation? Evidence from the 19Th-century Sewing machine industry*", June 2009, NBER Working Paper Series

Lampe R.L. and Moser P., "*Patent Pools: Licensing Strategies in the Absence of Regulation*", March 2012, Stanford University and NBER

Lemley M.A. and Shapiro C., *"Probabilistic Patent"* Journal of Economic Perspectives, Volume 19, Number 2, Spring 2005, Pages 75–98

Lemley, M.A. *," Intellectual Property Rights and Standard-setting Organizations*", 2002, California Law Review (ONLINE), vol. 90.

Lemley, M.A. and Shapiro, C.,"*Patent Holdup and Royalty Stacking",*2007, Texas Law Review, vol. 85, 7, 1991-2050. .

Lerner J. and Stern S.; *"Innovation Policy and Economy",* Volume 7; MIT Press 0-262-10121-1 February 2007

Lerner J. and Tirole J.. "*Efficient patent pools."* American Economic Review, 94(3):691–711, June 2004.

Lerner J., Strojwas M., and Tirole J. "*The Design of Patent Pools: The Determinants of Licensing Rules*." *RAND Journal of Economics* 38, no. 3 (fall 2007).

Lerner J., Strojwas M., and Tirole J., "*The Structure and Performance of Patent Pools: Empirical Evidence*" , January 11, 2003

Levmore S. , "*Two Stories About The Evolution Of Property Rights*", June 2002, Journal of Legal Studies. University of Chicago Press, Vol XXXI

Machlup F., "*An economic review of the patent system, Study commission by the Subcommittee on Patents, Trademarks, and Copyrights of the Committee on the Judiciary"*, U.S. Senate, 85th Congress, second session. Washington, D.C., 1958.

Merges R.P., "*Contractingin to Liability Rules: Institutions Supporting Transactions in Intellectual Property Rights*" 1996, California law Review

Merges R.P."*Institutions for Intellectual Property Transactions: The Case of Patent Pools*" , August 1999, University of California at Berkeley (Boalt Hall) School of Law Working Paper

Michelman F.I., "*Property, Utility, and Fairness:Comments on the Ethical Foundations of "Just Compensation Law",* 1967, Harvard law Review *II65,* 1214-18 (1967).

Mossoff A."*Exclusion and Exclusive Use in Patent Law*", Harvard Journal of Law &Technology, Volume 22, Number 2, Spring 2009

Nordhaus, W.D. , "*Invention, Growth, And Welfare: A Theoretical Treatment Of Technological Change*",1969, Mit Press.

Plompen P. , "*The New Technology Transfer Guidelines (TTG) as Applied to Patent Pools and Patent Pool Licensing: Some Observations Regarding the Concept of "Essential Technologies*", 2005, European Competition Law Annual 2005: The Interaction Between Competition Law And Intellectual Property Law 295, 299 et seq. (Claus Dieter. Ehlermann & Isabel Atanasiu eds., Hart Publishing 2007).

Quint D. *"Economics of Patent Pools when some (but not all) Patents are Essential",* November 2006, Stanfod Institute for economic policy reasearch,

Raymod D.G. , "*Benefits and Risks of Patent Pooling for Standards Setting Organizations*", 2002 16 Antitrust 41, 41.

Reinganum, J.F. , "*The Timing of Innovation: Research, Development, and Diffusion",* 1989 , Handbook Of Industrial Organization, vol. 1, 849-908.

Ripley W.Z. , "*Trust, Pools and Corporations*", Boston, Ginn & Company, 1916
Rogeers C. G. , "*The Sewing Machine: its Invention and Devolpment*", 2nd ed., Washington, D.C., Smithsonian Books, 1977.

Santore R., McKee M., Bjornstad D., "*Patent pools as a solution to efficient licensing of complementary patents? Some experimental evidence*", 2010,Journal of Law and Economics

Schlosseber. R.S. , "*Mergers and Acquisitions: understanding the Antitrust Issues*", third edition, 2008

Shapiro C., *"Navigating the Patent Thicket: Cross Licenses, Patent Pools, and Standard Setting", Innovation Policy and the Economy*, MIT Press2001, Vol1

Shapiro, C. ,"*Antitrust Limits to Patent Settlements"*, 2003, Rand Journal Of Economics, vol. 34, 2,

Shapiro, C. , "*Patent System Reform: Economic Analysis and Critique*", 2004, Berkeley Technology Law Journal, vol. 19, 3,

Smith H., "*Semicommon Property Rights and Scattering in the Open fields*", January 2000, The Journal Of Legal Studies, University of Chicago Press, Vol.29, No. 1

Skitol R. and Wu L., "*A transatlantic swim through patent pool: keeping antitrust sharks at bay," estract from the book "On the merits: Current Issues in competition and law policy :Liber Amicorum Peter Plompen*",2005, Paul Lugard and Leigh Hancher, Intersentia nv

Spulber D." *Innovation economics: The interplay among technology standards, competitive conduct, and economic performance*", Journal of Competition Law and Economics, 9(4): 777–825, December 2013

Tyler N.S. , "*Patent nonuse and technology suppression: the use of compulsorylicensing to promote progress*", 2014, University of Pennsylvania Law Review,

Waldeck W.P.Z. and Pyrmont, Martin J. Adelman, Brauneis R. ,Drexl J., Nack R., "*Patents and technological progress in a Globalized World*", Springer Science & Business Media, 20 nov 2008

Wilson B.B. , " *Remarks before the Fourth New England Antitrust Conference, Patent and Know-How License Agreements: Field of Use, Territorial, Price and Quantity Restrictions* "(Nov. 6, 1970).

WIPO. [2008], Standards and Patents, Retrieved: 2012, 06/30, available at: http://www.wipo.int/patent-law/en/developments/standards.html.

Young-Kwan Kwon, Yeonbae Kim , Tai-Yoo Kim , Yongil Song , "*Effects Of Patent Pools On Innovation Investment – Ex Ante Perspectives",* Journal of Business & Economics Research, July 2008, Volume 6, Number 7

http://americanhistory.si.edu/collections/search/object/nmah_1305689

https://pronkpapers.wordpress.com/tag/general-electric/

http://en.wikipedia.org/wiki/Wright_brothers_patent_war

http://www.mpegla.com/main/Pages/About.aspx

http://en.wikipedia.org/wiki/Technical_standard

http://www.justice.gov/atr/public/guidelines/0558.htm#t23

http://eurlex.europa.eu/legalcontent/EN/TXT/?uri=uriserv:OJ.L_.2014.093.01.0017.01.ENG

http://www.jftc.go.jp/en/legislation_gls/amended_ama09/amended_ama15_01.html

http://www.wsj.com/articles/SB10000872396390444358404577609810658082898

http://www.gsma.com/aboutus/history

http://en.wikipedia.org/wiki/3G

http://recode.net/2015/04/09/google-joins-stable-of-tech-companies-licensing-their-lte-patents-as-a-group/

Summary

The attempt of this paper is to understand and show if the formation of pools could facilitate information sharing and could increase spillovers in technology development, decreasing, at the same time, the degree of product differentiation.

Otherwise, on the contrary, if the pool can adversely affect the welfare, and so the technology progress, by reducing the incentives towards product development and product market competition, even with perfectly complementary patents.

The conventional opinion is that creation of patent pools is welfare enhancing when patents are complementary, but this view does not account for the hypothetically substantial role of the effect of pooling on the innovation.

My analysis would like to show, even with the use of mathematical tools, which are the real effects of the patents pool.

More in detail, I started introducing the idea of property, and the three types of it, which is at the base of the idea of Patent.

Then to reach my point it was necessary to start from the base of this system: the patent.

Fundamentally the study of the patents, and their denomination and their origin is at the centre of all the structure of the pool.

The different patents are the essential and no essential ones, and the substitutable and complementary ones.

The two concepts are linked; in fact the essential patents by nature are complementary.

Instead the main difference between substitutable and complementary is seen in the formation of the patent, in fact according to the guidelines the complementary patents could and have to be in a pool.

The substitutable at the contrary have not to be in the same pool in order to not be considered anticompetitive.

After having identified all the type of patents, I could introduce the concept of the patent pool in all its aspects, analyzing even the criteria of patentability.

In this phase I went through one of the main problem of patent linked to the unused of a resource, in order to analyze why a pool could be a successful solution.

The entire section two of the thesis is focus on the definition and the nature of the pool.

Then I went through the History of the patent pool to analyze the first examples in the formation of the pool, so the one of the Sewing Machine, passing through the one of the Automobile Manufacturers Association, the one of the radio transmitter (litigated between British Marconi, American Marconi, General Electric (GE), Westinghouse, American Telephone and Telegraph (AT&T), Lee De Forest and Edwin Armstrong), the one of the manufacturer's Aircraft Association and finally the biggest ones relative to

the telecommunication sector, until arrive to the most recent one that deals with the 4G/LTE system.

Moreover I thought that one more important step was to differentiate between all the guidelines, concerning the theme of anti competition in the field of the patent.

In my opinion the main resource to really analyze the actions of the pool and the reactions against them was to analyze the USA, the European and the Japanese guidelines, in order to have an idea about how so different nations could deal with it.

The starting point was the American Guideline; I began from the Nine No NOs, and then the successive and less strictly antitrust guidelines, “Antitrust Enforcement Guidelines for International Operations”, followed in the 1995 by “Antitrust Guidelines for the licensing of Intellectual property”.

Obviously each innovation carries with it pros and cons, even in this case. Fortunately the pool seems to create more pro competitive effects then competitive concerns.

So after having examined some cases I found out the principal pros and cons that I have explained in the chapter 4.

The pro competitive effects emerged after the analysis are: The prompt development of technology, the reduction of transaction fee, the authorization of blocking patents and the reduction of litigation costs.

In that phase I have pointed the main characteristics of the modern patent pool according to Daen Uijl, Bekkers e De Vries.

On the contrary the competitive concerns are: the alteration of competition, the discouraging effect on innovation, the protection of Invalid patents and the formation of patent Troll (like the one of Smarthflash).

The chapter 5, it's about the economic of the pool, I introduced different economics model like the one of Gilbert and Shapiro, the one of Lerner and Tyrole, the one of Brenner and the one of Aoki Nagaoka and finally the one of

Dequiedt and Versaevel but principally I talked about the more complete model, according to my opinion, made by Professor Daniel Quint about the economic interpretation of the pool.

The good idea in his thesis is to create different categories of pool, made up by different categories of patents and analyze all the economic positive or adverse situation and path.

Understandably I have taken the simplest part of the model, made up by an uncountable number of mathematical explanations, in order to arrive to the real effects of the different pools on the social welfare.

Indeed at this point the analysis of all the structure relative to the pool was also helpful.

Because according their structure the pools could be more complex, more expensive but at the same time more helpful.

The explanation of the formation of the pool, let introduce all the difficulties in creating a such huge organization.

Subsequently collecting all the information I could go more in detail in the 4G –LTE case, having the entire instruments to really analyze such a complex case.

The last chapter presents the conclusions; I choose to gather data about the real impact of the pool on the economy associated to the possible impacts that they probably had to have.

According to the examination there are different discrepancies.

Actually even if the number of patent cases was increased, this number is not directly proportional to the increasing number in aggregate R&D levels, this shows that the patent portfolio strategies may not be welfare improving.

Going more in deep in this analysis, taking the example of the Japanese pharmaceutical industry between 1983 to 1992, the increase in the R&D expenditure reflects an efficiency loss of 50%.

Moreover the incremental number of patent applications is a consequence of a portfolio battles and not of generally

needed R&D, this makes worse the relative situation of patent litigation.

This risk becomes a tax on innovation.

Probably what in the end emerges is that the regulation should be fixed according to the evolution of the patent, and the appearance of not predictable signs.

This is what I found out after having read many papers about pooling and after having examined different cases.

My principal resources comes from the World Wide Web, the focal topics I found were in the SISVEL webpage, which is the main important company dealing with Patent Pooling.

Then traditional library search was another method I have embraced for locating sources of information.

Since this argument is not purely economic, but also related to the law and legal world, I had to report some regulations from the EU and US antitrust guidelines for patent pool.